# THE GAS JOURNAL

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## A Glance at the Contents—

**Engineer and Manager Required.**

Applications are invited for the appointment of Engineer and Manager to the Newbury Corporation Gas Undertaking. [p. 655.]

**Gas at the Building Exhibition.**

The Gas Industry is well represented at the Building Exhibition which opened at Olympia on Sept. 14 last, a large number of leading firms in the Industry taking part. [p. 649.]

**S.B.G.I.**

A meeting of the Council of the Society of British Gas Industries was held on Thursday last. The autumn general meeting has been fixed for Thursday, Nov. 3, at the Hotel Metropole, London. [p. 631.]

**"Colloidal Fuel."**

The use of a mixture of oil and finely powdered coal in one of the boilers of the Cunard liner "Scynthia" during a recent trial run to New York has renewed interest in the subject of "colloidal" fuel, and a contributor to-day draws attention to various aspects of the matter. [p. 634.]

**Planning of Street Lighting Installation.**

In a paper which he read before the Association of Public Lighting Engineers on Sept. 7, Mr. F. C. Smith, of the Gas Light and Coke Company, dealt very comprehensively with the subject of planning gas installations to conform with the British Standard Specification for Street Lighting. [p. 635.]

**The New "Curvex" Gas Fire.**

A new gas fire, bearing the name "Curvex," and manufactured by the Parkinson Stove Company, Ltd., is a novel departure in design utilizing a special curved concave radiant in place of the usual straight or convex radiant fitted in a vertical or inclined position. [p. 633.]

**Concentrated Gas Liquor.**

A paper on the subject of the manufacture by modern methods of concentrated gas liquor and its utilization was presented at the annual meeting of the North British Association of Gas Managers, held at Ayr on Sept. 8, by Mr. R. J. Philp, Engineer and Manager to the North Berwick Corporation Gas Department. [p. 645.]

**Long-Service Awards at Southampton.**

Nearly 150 employees and pensioners of the Southampton Gas Company recently received long-service certificates from the Chairman of the Board of Directors, Sir Russell Bencraft, J.P. All of them had had more than 25 years with the Company, and there were eleven with over 50 years' association with the firm. [p. 631.]

**Gas at 2d. a Therm.**

On later pages to-day is an account of a new scheme which is likely to increase enormously the domestic consumption of gas in the Rotherham area. The principle of the scheme is simple enough—an optional two-part tariff consisting of service charge and commodity charge. The service charge varies from 9d. to 2s. a week, according to the size of house. The commodity charge—certainly a revolutionary price in gas supply—is 2d. a therm through ordinary meters and 2·4d. a therm through prepayment meters. [p. 630.]

## Forthcoming Engagements

Sept. 26 to 28.—B.C.G.A.—Annual Conference at Leeds.

Sept. 30.—INSTITUTION OF GAS ENGINEERS.—Meeting of General Research Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 4.—INSTITUTION OF GAS ENGINEERS.—Meeting of Sir Arthur Duckham Memorial Fund Committee, 3 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 5.—B.C.G.A.—Scottish District Conference at Dumbarton.

Oct. 6.—MIDLAND JUNIOR GAS ASSOCIATION.—Meeting in Birmingham. Presidential Address of Mr. F. A. C. Pykett.

Oct. 7.—NORTH OF ENGLAND ASSOCIATION.—Autumn Meeting.

Oct. 10.—INSTITUTION OF GAS ENGINEERS.—Meetings of Finance Sub-Committee, 2 p.m.; Finance Committee, 2.30 p.m.; Executive Committee, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 11.—INSTITUTION OF GAS ENGINEERS.—Meetings of Council, 10 a.m.; Board of Examiners, 12.15 p.m.; Gas Education Committee, 4 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 13.—INSTITUTION OF GAS ENGINEERS.—Meetings of Joint Lighting Committee, 11 a.m.; Gas Appliances Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 14.—SOCIETY OF CHEMICAL INDUSTRY.—Meeting of the CHEMICAL ENGINEERING GROUP, Burlington House, Piccadilly, 8 p.m. Paper by Prof. J. S. S. Brame on "Colloidal or Coal-Oil Fuel."

Oct. 20.—INSTITUTION OF GAS ENGINEERS.—Meetings of Refractory Materials Joint Sub-Committee, 11 a.m.; Pipes Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 20.—SOCIETY OF BRITISH GAS INDUSTRIES.—Meeting of Council at 56, Victoria Street, S.W. 1, in the afternoon.

Oct. 22.—MIDLAND JUNIOR GAS ASSOCIATION.—Visit to Messrs. Geo. Wilson Gas Meters, Ltd., Coventry.

Oct. 27.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at 28, Grosvenor Gardens, London, S.W. 1, 2.30 p.m.

Nov. 3.—SOCIETY OF BRITISH GAS INDUSTRIES.—Autumn General Meeting, Hotel Metropole, London.

# EDITORIAL NOTES

## *The Old Order Changeth*

A PAPER which will be of the greatest practical value to all concerned not only with gas lighting, but with public lighting generally, was presented at the meeting of the Association of Public Lighting Engineers this month; and though the nature of this contribution to the science and practice of illumination precludes its reproduction *in extenso* in the "JOURNAL," we publish an abstract which gives a true picture of its significance and which will doubtless whet our readers' appetites to study the complete communication, which is obtainable from the Institution of Gas Engineers. The paper by Mr. F. C. Smith, of the Gas Light and Coke Company, is an indication of at least two things. In the first place, it shows that the Gas Industry is alive to the fact that gas has nothing whatever to be ashamed of as a modern illuminant; rather that its claims are well founded. Secondly, it demonstrates the value of an organization such as that at Watson House, where a competent technical staff enjoy adequate facilities for investigation. With contributions of the standard of that under review—and they become more frequent yearly—it is idle to suggest that the Gas Industry is centuries behind the times and is incapable of appreciating the value of co-operative research. The paper is one which commands the respect of all scientifically inclined. It is, in fact, an excellent advertisement for the Gas Industry. Free from flamboyancy and controversy, it is obviously an honest attempt—and we believe a successful attempt—to gain for gas a technical prestige worthy of the unobtrusive research work so assiduously and efficiently pursued.

This research work to which we refer—and we are not now thinking in terms of any one particular organization—places fighting weapons into the hands of all responsible for the prosperity of gas undertakings. If advantage is not taken of the results of the work, something is definitely wrong with the Industry. But we cannot believe, taking a dispassionate survey, that investigations such as the one under review are solely useful to the paper manufacturer and the printing industry. Everything points to an increasing interest in new development; there is to-day greater internal activity in the Gas Industry than ever before. In putting its house in order it is not only polishing its old treasures, but is not afraid of a little futurist decoration, whatever its bitterest critics may affirm. Our idea is that the spirit of progress is in the Gas Industry—which is tantamount to saying that there is not a patting on the back for past achievements, but a determination to exploit what new knowledge comes along as the result of research work which the Industry pays for. Of course, we have not reached finality; of course, more remains to be done. But do at least let us have a little faith in ourselves.

Now what is this paper by Mr. Smith and his colleagues going to do? We think it is destined to be a guide to lighting engineers throughout the country; and if those responsible for gas lighting apply the author's sound advice, there will be little to grumble about in gas. Sinusoidal projection, azimuth angles, isocandle diagrams, and so on, may appear peculiar terms to the uninitiated; but the lighting engineer of to-day, if he is uninitiated, ought to earn his living under a different title. The paper is written by a man who knows something about gas for the man who knows something about gas; and we take it that the Gas Industry is employing people who know something about gas in its ranks—otherwise all the education schemes it sponsors are in vain. Quite a large proportion of the work of the American Gas Association is to provide its members and the Gas Industry generally with the results of research presented in a form which can be readily understood; and we are firmly of opinion that anyone who has had to tackle the problems involved in illuminating streets—whatever the illuminating source—will find a few hours' study of Mr. Smith's paper amply repaid, and will quickly realize the virtues of the "onion" diagram and the practical value of the remarkably clear graphs given in Appendix 2.

## *Reflections*

THE publication in the present issue of the "JOURNAL" of our abstract of Mr. Smith's paper recalls an occasion of great interest. The abstract—omitting, as was inevitable, the voluminous appendices—though occupying a considerable amount of "JOURNAL" space, gives no more than an idea of the extent of the author's labours. In addition, there was a paper on a similar scale submitted by Mr. G. H. Wilson, of the General Electric Company, and though, of course, neither author attempted at the meeting to give more than a summary of his communication, what each had to say provided matter for a full session. The resultant discussion was, as our report shows, a very good one indeed, and would no doubt have been even better had there been more time available. Luncheon, however, could not wait, and at the commencement of the morning session time had been devoted to more or less formal business which would otherwise have been available for discussing these two communications.

It may not be out of place here, perhaps, to remark upon the manner of presentation adopted by both Mr. Smith and Mr. Wilson. The task of adequately summarizing papers of such a character was not an easy one, but it proved well within the ability of each author to accomplish. The style of delivery (a supremely important consideration on an occasion like this) was beyond reproach, and it was a real pleasure to listen to these two exponents of different methods of arriving at the same end—the planning of installations to conform with the British Standard Specification for Street Lighting. Those in the meeting (and there appeared to be a good many of them) who were desirous of having a definite ruling laid down as to "which is the best and most economical system to adopt for public lighting—gas or electricity," may have disappointed. This was not the object of the authors, who had in view a far different aim from the depreciation of the wares of a competitor.

With such an immense amount of work involved in their preparation, it is almost a wonder that the papers ever got finished at all, and the Association are to be congratulated upon the fact that it was at one of their meetings that they were introduced. The contents must have proved difficult to assimilate at short notice, and this, indeed, led to the ventilating of an old grievance. This grievance was that prints of papers are not in the hands of members sufficiently early to permit of adequate study of their contents prior to the meeting at which they are to be presented. It is a complaint which is frequently ventilated at technical meetings, and there is no doubt that earlier availability of papers would often lead to fuller discussions.

Judging, however, from remarks which were made by the President (Mr. Harold Davies), the Council of the Association on occasion find it very hard to secure papers for their meetings; and we are all aware that there is some complication in asking favours and at the same time laying down conditions. If members are diffident of reducing their knowledge and experiences to writing, this diffidence is not likely to be lessened should consent to do so bring down upon them conditions embracing "must" and "shall." Yet one member asked what the Council were for, if not to insist upon compliance with rules which authors might find trouble in adhering to. Should the Council subsequently find that their difficulties in the way of procuring papers are at an end, then they will be able to lay down such regulations as they think likely to conduce to fuller discussion.

# Concentrated Gas Liquor

One of the means suggested by the Liquor Effluents and Ammonia Committee of the Institution of Gas Engineers to effect at any rate a partial solution of the sulphate of ammonia problem was the production of concentrated liquor. In this way transport charges are enormously reduced, and there are other advantages. Since that suggestion was made the situation in regard to the manufacture of ammonium sulphate has not become any better, and destructive methods have not only been considered, but practised. If any other alternative exists, however, destructive processes are definitely to be deprecated; and resort to them should be made only when every other constructive avenue—of which the production of concentrated ammonia is one—has been explored with an open mind. This idea, of course, was in the mind of the Liquor Effluents and Ammonia Committee, and it was forcibly expressed by the Chief Alkali Inspector in his last annual report. On this matter Mr. Damon said that "the apparent advantage derived by shutting down sulphate processes is likely to prove disappointing when all costs are properly estimated. . . . Destructive methods have been adopted, but . . . they have been abandoned." In view of this the paper by Mr. R. J. Philp before the North British Association of Gas Managers is opportune; it is a positive contribution which reflects credit on the author's enterprise and will undoubtedly prove helpful to many of his fellow gas engineers. It was unfortunate that lack of time at the meeting precluded adequate discussion.

Under the conditions at North Berwick—and similar circumstances surely apply to several other gas undertakings—Mr. Philp presents a well-reasoned case for the adoption of concentrated liquor manufacture. His particular plant is the Thorncliffe-Baldurie process, and it has quite transformed an uneconomic proposition in regard to the disposal of ammonia. At the time of installation of the plant, the author was faced with a loss of £166 a year on gas liquor, this sum representing transport costs. On the other hand, if he made concentrated liquor the charges for carriage would be reduced to £22, while the estimated costs entailed in the concentration would amount to not more than £38—thereby reducing the loss from £166 to £60 a year, allowing nothing for the ammonia. This in itself was justification for the adoption of the process; and, in addition, there was the prospect, subsequently realized, of obtaining a satisfactory price for the concentrated liquor. In the result—all the details are set out by Mr. Philp—there is an advantage derived by installing the plant of £130, and this takes into account interest and depreciation.

In regard to the Thorncliffe-Baldurie process itself, the author is full of praise. The plant is admirably designed for the conservation of heat, which means, of course, low costs for steam. Actually there is little difference between the consumption in the plant and the theoretical quantity required. Then another most important feature is the automatic control of the plant, which has functioned with complete satisfaction. There is, in fact, "no need for any labour in the manufacture of concentrated gas liquor by the process." The rate of feed of gas liquor to be concentrated, and the supply of steam, are maintained substantially constant by suitable delicate controls. Steps are also taken to legislate for an increase of pressure beyond a certain pre-determined one, caused by crystallization of ammonium bicarbonate. Mr. Philp's remarks on the discarding of any attempt to recover fixed ammonia, and on the chemical control of the process, will meet with general agreement, while what he has to say on the possibilities of employing concentrated liquor for the manufacture of ammonium bicarbonate is certain to arouse more than a little interest. He describes and illustrates a suitable process, of which no doubt more will be heard if success attends the experiments which are at present being conducted at Rothamsted with a view to determining the value of ammonium bicarbonate as a fertilizer, in substitution, or partial substitution, for sulphate of ammonia. On the subject of the extended application of ammonium bicarbonate, Mr. Parrish, of the South Metropolitan Gas Company, has a note on its use for preventing fungoid growth in fruit storage, and also on the possibility of employing concentrated ammonia liquor for the ammoniation of calcium superphosphate. At present, with the law regarding solubility as it is, and with the apparently fixed convictions of the English superphosphate manufacturers, the prospects are not good in this direction; but "it is conceivable that fresh uses may be found for concentrated ammonia liquor, and the position is a promising one."

We feel that Mr. Philp's hope will be fulfilled that his paper will be of service to small, medium, and large works, and that it may lead to greater interest in the treatment of gas liquor by more modern methods evolved as a result of economic exigencies.

# Gas Cheaper than Coal

Our readers are aware of the circumstances which make it possible for the Rotherham Corporation Gas Department to offer gas to industry at the remarkably low price of 1½d. a therm. These circumstances are admittedly extremely favourable, but this fact does not in any way belittle the praiseworthy enterprise of Rotherham. As the Engineer and General Manager, Mr. J. T. Haynes, pointed out at the meeting of the Institution of Gas Engineers last June, gas at 1½d. a therm was not offered in any spirit of bravado. Last year the industrial consumption in the Rotherham area increased by 25 p.ct. and represented 48 p.ct. of the total output; and increases of a like nature are confidently anticipated for the current year.

On later pages to-day is an account of a new scheme which is likely to increase enormously the domestic consumption of gas in the Rotherham area. The principle of the scheme is simple enough—an optional two-part tariff consisting of service charge and commodity charge. The service charge varies from 9d. to 2s. a week, according to the size of house. The commodity charge—certainly a revolutionary price in gas supply—is 2d. a therm through ordinary meters and 2·4d. a therm through prepayment meters. This is no small selling-point. It means, for example, that a small gas fire costs only ¼d. an hour. To test the scheme, ten houses have been fitted with complete gas equipment to eliminate coal fires. Gas is the sole means of heating, cooking, and water heating; and the official trial is to occupy three months commencing Oct. 1. As a matter of fact, however, the installations were completed some little time ago, and everything points to the success of the venture. All the consumers are well satisfied, the gas consumed has more than trebled, and the income to the Gas Department has more than doubled. Mr. Haynes' policy is a full-blooded one which commands respect.

# Correspondence

## *Calorific Values and Their Relation to Working Results and Costs*

Sir,—I am very interested in the paper read by Mr. James Jamieson, of Edinburgh, on the above subject. There is a fund of information in the paper. But what conclusions can be drawn from it? If a standard price were fixed for the cost of coal in each case, and a standard price for the residuals, how would the figures look?

In my experience they would be something like this:

*The Lowest Prices (approx.) at which Town Gas can be Sold in very Large and Regular Quantities as at Present Manufactured, and when Bye-Products are taken into account in each case at a standard figure, and the Cost of Coal also.*

| In a quality of— | | | | | | |
|---|---|---|---|---|---|---|
| 100 | B.Th.U. | per | c.ft. | rate | per | therm | 1·00d. |
| 200 | ,, | ,, | ,, | ,, | ,, | | 1·00d. |
| 300 | ,, | ,, | ,, | ,, | ,, | | 2·00d. |
| 400 | ,, | ,, | ,, | ,, | ,, | | 3·00d. |
| 500 | ,, | ,, | ,, | ,, | ,, | | 5·00d. |
| 600 | ,, | ,, | ,, | ,, | ,, | | 6·00d. |

Yours, &c.,
Geo. Helps.

*Nuneaton Gas Company.*
*Sept.* 17, 1932.

## PERSONAL

**Presentation to Mr. McDowall.**

On Thursday, July 28, Sir David Milne-Watson, in the name of the Directors of the Gas Light and Coke Company, presented Mr. W. McDowall, the retiring Stores Buyer, with a diamond ring as a memorial of his long and faithful service, which has been devoted entirely to the Company.

In making the presentation, Sir David recalled that Mr. McDowall entered the Company's service as a junior clerk in the Stores Department in September, 1876, was appointed Deputy Chief Stores Clerk in May, 1903, Stores Buyer in December, 1907, and Chief Officer of Stores in May, 1915, his title being again altered to Stores Buyer on the re-organization of his Department in 1929.

Sir David stated that Mr. McDowall had served the Company for fifty-six years, or a period nearly equal to half of the Company's existence, during which time he had seen the office of Secretary successively held by no fewer than five individuals. Mr. McDowall, he said, had also represented the Company on the National Gas Council and the Executive Committee of the British Commercial Gas Association.

Sir David reminded the Board that when Mr. McDowall completed fifty years' service in 1926, they had presented him with an inscribed gold wrist watch and bracelet to mark the occasion, but said that the Directors now felt that a further mark of their esteem and regard was required as Mr. McDowall was finally severing his connection with the Company. In the name of the Board he wished him many years of health and happiness in his retirement.

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**Presentation to Mr. A. M'I. Cleland.**

A pleasant little function took place on Friday evening, Sept. 16, at the Workshops of the Outdoor Department of the Belfast Corporation Gas-Works, Bankmore Street, when the staff and employees welcomed Mr. A. M'I. Cleland, M.Inst.Gas E., late Distribution Superintendent, in order to present him with substantial tokens of their regard on his retirement from office after thirty-eight years' service. The chair was taken by Mr. J. Reid, Acting Distribution Superintendent, supported by Mr. W. M'Connell, Chief Foreman. The latter, after expressing the regret of the whole Department that Mr. Cleland had felt compelled to retire, presented him with a first-class half-plate camera with Ross lens and telephos attachment; a fumed oak study table with nest of automatic locking drawers; and an embossed and gilt leather wallet containing the autographs of all the subscribers. At the same time Mrs. Cleland was presented with a set of British-made cut-glass goblets and water jug.

In a short address to those assembled, Mr. Cleland, after thanking them very warmly for their generous gifts, pointed out that his guiding principles during office had always been to make character the chief claim to consideration, apart from all other influences; to endeavour to act fairly to those under his control, as well as to the public and the Gas Committee; and to try to establish a reputation for firmness in all his business dealings. He pointed out that they were engaged in a very prosperous commercial undertaking which would continue to be prosperous so long as they exhibited that same spirit of loyalty to the Department and the public in the future it had been his pleasure to observe in the past. Finally, he commended to their continued consideration the claims of the Royal Victoria Hospital, reminding them that the men of the Outdoor Department of the Belfast Corporation Gas-Works were the first body in Belfast to inaugurate a regular weekly hospital collection. The Royal Victoria Hospital was very dear to his heart; and he asked that, though he was now on the retired list, they would allow his name to remain on their list of contributors. The proceedings then terminated.

On Aug. 31, the date of his actual retirement, Mr. Cleland also received from the Staff of the Gas Committee a very handsome 5-tier Gunn expanding bookcase in fumed oak, Mrs. Cleland at the same time being presented with a mahogany cake stand of chaste design. On this occasion the presentations were made by Mr. J. D. Smith, M.Inst.C.E., M.Inst.Gas E., Engineer and Manager, supported by Mr. J. Hyslop, M.Inst.Gas E., Assistant Engineer, and Mr. W. J. M'Millan, Cashier and Collector.

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Mr. W. H. DREAPER has been appointed Manager of the Victoria Branch of the British Columbia Electric Power and Gas Company, Ltd., in succession to Mr. F. H. HEWLINGS, who has retired.

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In the offices of the Kirkham Gas Company Mr. JAMES CROOK, who retired from the position of Secretary and Manager of the Company at the end of August, after nearly forty years' service, was presented with a mahogany timepiece.

## OBITUARY

The death occurred on Sept. 16 of Mr. LEONARD JOHN WEAVER, Engineer and Manager to the Newbury Gas Department, aged 31 years. Deceased was first taken ill on Friday, Sept. 9, and was confined to his bed until his death. On the morning of Sept. 16 he seemed well on the way to recovery, but suffered a relapse and died a few moments later. He leaves a widow and one child. Mr. Weaver was articled to Mr. H. C. Page at the Canterbury Gas-Works, later being appointed Assistant to Mr. J. J. Paterson at the Dover Gas-Works. He was appointed Engineer and Manager to the Newbury Corporation Gas Department on Jan. 1, 1931, a position he held till his death.

# THE NEWS OF THE WEEK

**The Inaugural Ceremony** of the 1932-33 Session of the Sir John Cass Technical Institute will take place on Thursday, Oct. 6, at 8.15 p.m., when Viscount Burnham will give an Address.

**First Prize** in the class for the best tradesmen's entry at the Carnival in connection with Helston Harvest Fair on Monday, Sept. 12, was won by the Helston Corporation Gas Department.

**The Birkshall Gas-Works** of the Bradford Corporation were visited last week by a party of French students who were in Bradford as special guests of the city Education Committee, and whose itinerary during the visit included certain of the chief public institutions.

**By Unanimous Decision,** the Ashburton Urban District Council on Sept. 13 decided (subject to the approval of the Board of Trade) to sell their Gas Undertaking to the Devon Gas Association, the transfer to become effective on March 31 next year. It was stated that the purchase price would enable the Council to wipe off all outstanding loans and liabilities, and would leave a little over. It was added that the Gas Committee had asked the purchasers to consider favourably the retention of the men now employed at the works.

**Correction.**—In the "JOURNAL" last week, p. 567, it was stated that Mr. N. C. Sturrock, of Port Glasgow, had been awarded a Second-Class Certificate in Gas Engineering in the recent Examinations of the Institution of Gas Engineers. Actually Mr. Sturrock gained a First-Class Certificate.

**The Bingley Lighting Committee** recommend an allowance of additional discount of 5 p.ct. off the yard price of gas coke to any consumer taking a minimum of 400 tons per annum. They also propose to supply the local organization of the unemployed with 2 cwt. of coke per week, free of charge, up to the end of December, subject to the organization collecting the coke at the works.

**Two Competitions** for next year are being organized by the Association Technique de l'Industrie du Gaz en France—one for the most effective improvements in the manufacture and distribution of gas and one for improved apparatus for the utilization of gas and in particular in respect of large cooking installations and industrial applications of gas. Full particulars of the competition—entries for which close on Dec. 31 next—can be obtained from the Association at 21, Rue Blanche, Paris.

**The Australian Gas Light Company** report that the net profits for the past year, including the balance brought forward (£27,304), amount to £281,952, less dividend at the rate of 3¼ p.ct. paid in February, 1932, leaving a balance at the credit of profit and loss account of £148,377. The Directors now recommend the payment of a dividend for the past half-year at the rate of 3 p.ct. on the "A" and "B" shares, which will absorb £123,300, leaving a balance to be carried forward of £25,077.

**The South Australian Gas Company** shows a profit for the year ended June 30, 1932 (before providing for special purposes fund), after paying interest on bonds and adding balance £2398 carried forward from last year, of £71,386. This has been applied in the following manner: Dividend for half-year ended Dec. 31, 1931, at the rate of 4 p.ct. per annum, £28,000; dividend for half-year ended June 30, 1932, at the rate of 4 p.ct. per annum, £28,000; and transferred to special purposes fund, £15,386.

**The Dewsbury Gas Committee**, last week, gave favourable consideration to a suggestion by the Borough Gas Engineer (Mr. H. L. Bateman) for the installation of a gas compression plant at the local works, for compression of gas in steel cylinders for transport uses on the lines of that in operation in Paris and in contemplation in London, Birmingham, Chesterfield, and Newcastle. The Committee instructed the Engineer to obtain all necessary further particulars on the matter and arrange for an inspection of such plant by representatives from Dewsbury.

**Gas Progress in Czecho-Slovakia.**—It is announced from Prague that the Witkowitz Ironworks Company has lately taken up the construction of gas-works equipment and has secured a contract for the reconstruction of the gas-works in the Moravian town of Olmutz. It is also reported that, there being no available space for the extension of the gas-works in the towns of Tetschen and Bodenbach which are only separated by the River Elbe, the municipal authorities of the two places are at present considering a scheme for the establishment of a new jointly owned gas-works.

**Excellent Sites for Works**, where gas is cheap, is the message conveyed in a leaflet recently issued by the Newcastle-upon-Tyne and Gateshead Gas Company, inviting industrialists to put down their factories on the excellent ground available in the district and take advantage of the services of the Company's Industrial Heating Staff, retained to deal with all heating problems, large or small. The Company has an Industrial Service Laboratory, where batches of work can be dealt with under factory conditions, thus enabling the industrialist to arrive at definite production costs before installing plant.

## East Kent Gas Company.

The East Kent Gas Company, which was formed nine years ago, states a recent issue of the "Financial Times," supplies an area of some 200 square miles. Steady expansion has taken place and sales of gas have mounted year by year. During the twelve months to the end of March last the direct supply of gas to consumers at Wye was taken over, the Wye Lighting, Heating, and Power Company having been voluntarily liquidated. In that period the quantity of gas sold was double that of the preceding year and a considerably larger number of connections made.

As a result profits were substantially increased. This allows of the dividend being maintained for the fourth successive year at 4½ p.ct. on the share capital, a majority of which is controlled by the Tilmanstone (Kent) Collieries, while largely augmenting the free balance carried forward. The results testify to the able management of the undertaking.

## An Example of Service.

"Sales Manager" contributed to a recent issue of the "Electrical Review" the following example to throw light on the continued popularity of gas for domestic purposes. We agree that service of the kind he illustrates is of the very first importance, and is bound to receive its reward:

"Perhaps the experience described below will throw some light on the continued popularity of gas for domestic purposes.

"I have just moved from one house in Birmingham to another. Before vacating the one I had the meters—gas and electricity—read. No charge was made for this reading by the Gas Department, but I have received a bill 'To fee for special reading of meter, 2s. 6d.,' from the Electricity Department.

"Upon entering the new premises I found two notices, one from each department. The Gas Department notice reads: 'It is necessary that the order form herewith shall be signed by the applicant for gas supply and sent to Birmingham Gas Department as early as possible. Prompt attention will oblige,' and it is endorsed 'Gas left on for you.'

"The Electricity Department notice reads: '. . . Notice having been received of a change of tenancy, the supply to the above premises will be discontinued after 4 o'clock on the 30th day of August unless the incoming tenant attends at the offices of the Electricity Supply Department, 14, Dale End, and signs an agreement for the supply.'

"I happen to be busy all day struggling to earn my living selling electrical apparatus that builds a load for the Electricity Department, and it is not convenient for me to attend a summons of this kind. I have advised the Department accordingly, and now await developments."

## S.B.G.I. Prizes in the City and Guilds Examinations.

Published below is a list of the winners of the prizes given by the Society of British Gas Industries in the City and Guilds of London Institute's Examinations in Gas-Works Practice, Gas Supply Practice, and Gas Fitting.

MINOR COURSE IN GAS-WORKS PRACTICE.

| | | |
|---|---|---|
| 1st Prize. | £5 5s. | William Carter Higgs. Examined at Basingstoke |
| 2nd Prize. | £2 2s. | John Edmund William Simons. Examined at East Ham |

MINOR COURSE IN GAS SUPPLY PRACTICE.

| | | |
|---|---|---|
| 1st Prize. | £5 5s. | John Nicholson Thomson. Examined at Kirkcaldy |
| 2nd Prize. | £2 2s. | Frederick William Sidaway. Examined at Birmingham |

FINAL EXAMINATION IN GAS FITTING.

| | | |
|---|---|---|
| 1st Prize. | £5 5s. | Leonard Charles Turner. Examined at Westminster Technical Institute |
| 2nd Prize. | £2 2s. | John James Asquith. Examined at Newport (Mon.) |

## National Association for Salesmanship.

The inaugural meeting of the National Association for Salesmanship was held at the Hotel Victoria, London, on the evening of Wednesday, Sept. 14. Sir Francis Goodenough, C.B.E., took the chair, and was elected the first President of the Association. In the course of a speech in which he proposed the resolution which brought the Association into being, Sir Francis said:

The new Association will be conducted by and as an offshoot of the Incorporated Sales Managers' Association. Membership is open to all men and women over 18 who are engaged in the vocation of selling and desire to qualify for promotion and become sales managers. Among the methods proposed for attaining its aims and objects are the arrangement of regular series of addresses and discussions of interest to those engaged in selling; the provision of a library and reading room; the establishment of an employment bureau and a benevolent fund for the benefit of members; and, eventually, for the examination of those desirous of becoming members and the awarding of certificates to successful candidates. In a word, this development of the work of the Sales Managers' Association is essentially educational in its aims, in the widest sense of the word, and is designed to do all that can be done by those possessing practical experience and occupying authoritative positions in commerce to give effect to the recommendations of the Government Committee on Education for Salesmanship.

We of the parent body feel confident that, in co-operation with the British Association for Commercial Education, the National Association for Salesmanship will be able to do valuable service to commerce and industry by promoting the effective education and training of salesmen, sales managers, and sales directors of the future.

The business world at large has been all too slow in recognizing the fundamental importance to industry (and therefore to the material well being of the nation) of those whose work is to secure and retain customers for the products of industry. The status and rewards which should be given to them have only as yet been conceded by a minority of business houses, all of whom, however, are to be found in the front rank of progress and success. Equally slow has the business world been in appreciating the need for carefully selected, well educated, and efficiently trained personnel throughout the commercial organization of every firm.

Up to now, the best brains engaged in industry and commerce in this country, with striking exceptions too few to affect the argument, have been concentrated on the problems of production and finance to such a degree as to prevent adequate attention being given to the problems of

## *THE NEWS—continued.*

marketing, on which the continuance of production and the success of finance depend.

It will be the primary aim of the new Association, as it is of the parent body, to bring about a change of attitude towards this crucial question and to ensure a steady increase in the number of competent salesmen and sales managers available for recruitment in the anxious and trying times that confront British Industry at this moment and in the era of permanently acute competition upon which we have entered. All who wish well to the trade of the country will, I am confident, wish well to the National Association for Salesmanship.

## Good Publicity.

Though perhaps a little belated, opportunity may be taken now to reproduce a quotation which we have come across taken from an issue of the "Advertiser's Weekly." It refers to the advertisements published by the Gas Light and Coke Company regarding their success in connection with the contract for the lighting of Regent Street:

"The fact that the Gas Light and Coke Company holds the contract to light Regent Street, 'The first street in Europe,' and others equally famous, until 1947, certainly gives them something to shout about, and they have made the most of it. In my opinion, bearing in mind the product to be sold, it was almost a perfect advertisement—and I only qualify it because, like everyone else, I have no notion what a perfect advertisement is.

"The illustration was delightful, the layout and typography distinctive, original, and arresting, and the facts were interestingly and briefly related. Gas is so often associated with Sherlock Holmes and wax flowers. Nothing could have demonstrated more abruptly and effectually that it plays a big part in social services than this distinguished announcement. I wish suppliers of electricity would jump to it as effectively and as neatly. But they were always a trifle mediæval in their outlook."

## Gas at High Pressure.

At the autumn meeting of the Iron and Steel Institute held at the Institution of Civil Engineers, Westminster, last week, Mr. Frank S. Marsh, of Chesterfield, gave particulars of research which has been carried on at Chesterfield since the war into the use of light-weight high-pressure gas cylinders.

As a result cylinders have recently been made of nickel-chromium-molybdenum steel which enable gas to be compressed at a pressure greater than 3000 lbs. to the sq. in. Regulations at present do not permit the use of compressed gas at higher than 1800 lbs. to the sq. in.

In the course of his paper Mr. Marsh said that the increased attention which had been given to the storage of gas under high pressures had necessitated consideration of the problem of making containers which would be absolutely safe. Gas under high pressure was being used extensively, but it would be realized that the container must be rigid under very severe conditions. New steels had been produced which were very suitable for this work. He described experiments which included hydraulic-pressure, bursting, and bullet tests, and said that the results of these and chemical analyses indicated that light-weight high pressure containers could be relied upon.

A discussion followed. Prof. Henry Louis, of Newcastle, spoke of the benefit which the use of these cylinders by motor vehicles would confer on the coal and steel industries. Motor vehicles might then be propelled by coke oven gas instead of by petrol. Coke oven gas was a bye-product the importance of which was apt to be disregarded by steel makers. Were there a big demand for it the price of steel would be reduced and British manufacturers would be able more effectively to compete with foreign manufacturers.

Dr. W. H. Hatfield, of Sheffield, said that the procedure adopted in the use of nickel-chromium and molybdenum steel undoubtedly had given a reliable high tensile cylinder. This great strength was obtained by the retention of the high tensile properties of the steel. It was accompanied by excellent ductility which permitted the abnormal accidental conditions which the cylinders might experience. The presence of molybdenum enabled the cylinders to be so treated that the rate of cooling was not too rapid.

Mr. Marsh, in reply, said that there was no doubt that the cylinders would be used by motor vehicles. One had already been fitted successfully with the cylinders, and had given satisfaction. He himself would put such a vehicle on the road as soon as he could get the sanction of the authorities. It would run on coke oven gas. An omnibus fitted with six of these high-pressure cylinders could run a distance of 70 miles at a cost of 3s. 6d., and this was equivalent to 6d. a gallon. Mr. Marsh added that a test would be carried out with a Corporation 'bus fitted with six cylinders filled with coke oven gas at Chesterfield within the next few weeks.

## Novel Gas Price Scheme.

### Rotherham's Interesting Experiment.

The Rotherham Gas Committee has lately investigated the possibilities of reducing the price of gas for household use. In a report, Mr. J. T. Haynes, Engineer and General Manager, states that the principle behind the experiment now being made in Rotherham has been known for some time, but the method of its application in the Borough is new to the Gas Industry.

By the Gas Act of 1871, states Mr. Haynes, any house owner or tenant within 25 yards of a gas main can demand a supply of gas, and the gas authority must provide the necessary main pipe, service, and meter, under certain conditions, without any guarantee that gas will be used. And, if gas is used, no matter how small the quantity, the price charged must not be more than a specified price per 1000 c.ft.—in Rotherham 4s. 6d. (The present price of gas is only 3s. per 1000 c.ft.) Many consumers do not use sufficient gas to pay the interest on the capital cost incurred, and therefore the larger consumers must pay enough to cover the cost to the small consumers. This keeps the price of gas high, and the high price prevents people from using more gas, and so the price remains high—a vicious circle.

Though the Gas Industry has not the same freedom of action as has the electricity industry, it is empowered to make contracts with individual consumers, under certain conditions. By exercising these rights the Rotherham Gas Committee proposes to put the principle of a two-part tariff into operation.

The two-part tariff consists of a standing "service" charge according to the size of the house and a "commodity" charge for all gas used. The proposed "service" charge is:

| | s. | d. | |
|---|---|---|---|
| Aged persons' cottages (Corporation) . . . | 0 | 9 | per week |
| Non-parlour type houses (Corporation) and cottages with not more than 4 principal rooms | 0 | 10 | ,, |
| Parlour type houses (Corporation) and cottages with 5 or 6 principal rooms . . . . . | 1 | 0 | ,, |
| Houses with 7 or 8 principal rooms . . . . | 1 | 3 | ,, |
| Houses with 9 or 10 principal rooms . . . | 1 | 6 | ,, |
| Large houses with more than 10 rooms . . . | 2 | 0 | ,, |

NOTE: Where slot meters are used these charges must be paid weekly.

The proposed "commodity" charge for all gas used as registered by meter in accordance with the Gas Acts is:

10d. per 1000 c.ft. (2d. per therm) through ordinary meters
1s. per 1000 c.ft. (2·4d. per therm) through slot meters

This low price of gas—10d. per 1000 c.ft.—means that a small gas fire will cost only ¼d. per hour, and all the hot water required for the house can be had for about 1d. per day.

That is the scheme, purely optional to the consumer, which has been evolved by the Rotherham Gas Committee, but before putting it into operation generally it was considered advisable to prove by practical demonstration that:

(*a*) The scheme is workable.

(*b*) It can be used by poor people.

(*c*) It is profitable to the Gas Department.

By arrangements made between the Gas and Housing Committees and the respective tenants, ten Corporation houses have been put on the scheme and fitted up with complete gas equipments to do away with coal fires. Electric lighting has not been interfered with. An oak mantel, tiled surround, and attractive gas fire has been fitted in the kitchen in place of the coal range; a gas heated water circulator has been fitted to the water cylinder in place of the back-boiler; a gas incinerator has been supplied to burn household refuse; and gas fires have been fitted in sitting rooms and bedrooms where necessary. These all can be considered as landlords' fixtures. In addition, the houses have been equipped with modern gas cookers and gas wash-boilers as tenants' fixtures. The tenants of the houses range from a young married couple to a family of nine, and their previous gas consumptions ranged from *nil* (although gas was laid on) to over 24,000 c.ft. per annum. All are supplied through slot meters set at 720 c.ft. for 1s., and the service charge is paid to the Corporation rent collectors.

The official test will be for three months commencing Oct. 1 next, but as the installations were carried out a

few weeks ago some experience has been gained already, and the reports received indicate that:

(*a*) The scheme is workable.
(*b*) All the consumers are satisfied; several are enthusiastic.
(*c*) The gas consumption has more than trebled, and the income to the Gas Department more than doubled.

## Society of British Gas Industries.

A Meeting of the Council was held at 56, Victoria Street, Westminster, S.W., on Sept. 15—Mr. E. J. Fox, the Chairman, presiding. Those present were: Dr. E. W. Smith, Messrs. C. A. Goodall, H. A. Hobson, W. J. Gardner, L. Hartley, A. Comley, D. W. Turner, Frank West, G. Clark, Chas. S. Bennett, W. H. Handley, T. F. C. Potterton, J. Orme, B. B. Waller, T. A. Clapham, E. J. Davison (Hon. Secretary), F. J. Gould (Hon. Treasurer), and Arthur L. Griffith (Secretary). Apologies for absence were reported from Messrs. H. E. Bennet, H. M. Thornton, and Ernest West.

The names of the candidates recommended for the prizes offered by the Society upon the results of the recent Examinations of the City and Guilds of London Institute in Gas-Works Practice, Gas Supply Practice, and Gas Fitting were reported and the awards approved. The names of the prize-winners are announced on p. 629 of to-day's "JOURNAL."

It was reported that the appeal which had been sent out for funds for the British Refractories Research Association had met with a generous response from the Associations in the Gas Industry, with the result that the amount required to secure a continuance of the Government Grant had been exceeded.

The Autumn General Meeting was fixed for Thursday, Nov. 3, at the Hotel Metropole, London, under the Presidency of the Rt. Hon. L. S. Amery, M.P.

A letter was submitted from the Institution of Gas Engineers inviting the Council to nominate two members to serve on the Committee which is being set up to consider the inauguration of a fund in memory of the late Sir Arthur Duckham. The Council nominated the Chairman (Mr. E. J. Fox) and the Vice-Chairman (Mr. H. E. Bennet) to represent the Society on the Committee.

## Long Service Awards at Southampton.

Nearly 150 employees and pensioners of the Southampton Gaslight and Coke Company recently received long service certificates from the Chairman of Directors, Sir Russell Bencraft, J.P. All of them had had more than 25 years with the Company, and there were eleven with over 50 years' association with the firm. Mr. George Thomas Blake had the distinction of having the longest record—he joined the Company 61 years ago.

The certificates were worthy of the unique occasion. In the design were representations of the Company's Offices in Above Bar, a view of the Bargate, an aerial picture of the Docks, and another view of the floating dock. There were photographs of Sir Russell Bencraft, J.P., who also signed each certificate, and of the late Mr. J. R. H. Jacobs, who, as Managing Director, endeared himself to the staff. The presentations were made in the large messroom of the Company at the Marine Parade Works, and Sir Russell, who was heartily received, was accompanied on the platform by Col. Sir Edwin Perkins, C.B.E., J.P., Mr. A. W. Oke, Mr. R. C. S. Pearce, Mr. T. Carmichael, and Brigadier E. M. Jack (Directors), Mr. S. E. Whitehead (Engineer and General Manager), Mr. H. Runham (Secretary and Accountant), Mr. E. Dunbar (Assistant Engineer), and Mr. F. H. Pitman (Cashier and Chief-of-Staff).

In opening the proceedings, Sir Russell said it was a matter of great satisfaction that the Directors were able to meet the employees on such a happy occasion. He referred to Mr. Carmichael, who was an eminent Gas Engineer, and Brigadier Jack, who had taken the pains, during the short time he had been on the Board, to make himself known to many of the employees. Turning to the main reason for the gathering, Sir Russell said it was an extraordinary thing that 150 men still living had put in more than 25 years' service with the Company. He was very glad to be able to welcome them, and to hand to them some little recognition of their long and faithful services.

The first certificate was presented by the Chairman to Mr. A. W. Oke, who had 41 years' service. Mr. R. C. S. Pearce, another Director, with 30 years' service, also received a certificate, and Mr. Frank Durkin (Resident Engineer) who had 47 years' service, and Mr. Frank Lewis (until recently the Secretary), with 43 years' service, were similarly honoured, after which certificates were handed to the other veterans of the Company.

It fell to Sir Edwin Perkins to voice the gathering's thanks to the Chairman for his presence. The function had been one of the happiest he had attended, added Sir Edwin, who said that he thought few companies employing a large staff had so many men of long service as the Gas Company. That meeting of veterans spoke well both for the management and the staff. In these days nothing could succeed in business unless there was a spirit of goodwill, and they wanted goodwill instead of what they unfortunately saw elsewhere—discontent. Anything the Directors of the Gas Company could do for the betterment of their employees would be done, and he hoped they would all pull together for the benefit of the concern in which they were interested.

The resolution of thanks to Sir Russell was seconded by Mr. Whitehead on behalf of the employees.

## National Gas Council.

### Central Executive Board.

A Meeting of the Central Executive Board of the National Gas Council was held at 28, Grosvenor Gardens, London, S.W. 1, on Tuesday, Sept. 13.

In the absence of Sir David Milne-Watson, the chair was taken by Alderman J. H. Lloyd, J.P.

*The late Sir Henry Wade Deacon.*—The Chairman referred with deep regret to the death of Sir Henry Wade Deacon, C.B.E., J.P., the Chairman of the Liverpool Gas Company and a Trustee of the National Gas Council. It was agreed that a letter of condolence be sent to the relatives of Sir Henry Wade Deacon, and a vote of sympathy was passed, all standing.

*Public Lighting at Hailsham.*—It was reported that the Rural District Council of Hailsham, which had recently become the Lighting Authority for its area, had invited tenders from the Eastbourne Gas Company and the Electricity Department of the Eastbourne Corporation for street lighting purposes. It appeared that the Eastbourne Gas Company had supplied gas during the period when the public lighting was under the control of the Parish of Hailsham, and the Gas Company therefore submitted a tender in accordance with the form issued by the Council. The Electricity Department, however, not only submitted a tender in accordance with the form issued, but put forward an alternative form of tender on the basis of a ten year contract in lieu of the terms of the original tender, which provided for a period of 38 weeks. The Hailsham Council accepted the offer of the Electricity Department on the ten year contract without giving the Gas Company an opportunity of tendering on a similar basis. At the request of the Gas Company a Public Inquiry was held by the Ministry of Health, when the whole question was gone into in detail. The result of the Inquiry has not yet been announced.

*Coal.*—The thanks of the Board were expressed to Mr. H. D. Madden (Cardiff) and Mr. J. H. Canning (Newport, Mon.) for the valuable articles which they had written and which had appeared in certain South Wales newspapers, the gist of which was that the fortunes of the coal industry must, as time went on, become more and more dependent upon the prosperity of the carbonizing industries, which alone could effectively combat the menace of imported oil.

*Rating and Valuation (No. 2) Act, 1932.*—A letter addressed by the Central Valuation Committee to all Rating Authorities, dated July 26, was considered, suggesting that where in the case of hereditaments extending into more than one rating area a single valuer had not been appointed in accordance with the recommendations of the Central Valuation Committee, the Rating Authorities concerned should convene a conference for the purpose of agreeing upon the appointment of one valuer to value extensive hereditaments. The Central Valuation Committee further suggested that, where no such action had yet been taken, the first step might properly be taken by the Rating Authority in whose area the Head Office of the Undertaking was situated. The Central Executive Board agreed that where, in spite of this letter, Rating Authorities still appeared reluctant to act on the suggestions of the Central Valuation Committee, it would be as well if the Undertakings concerned would communicate with the National Gas Council, who would then be prepared to make representations to the Central Valuation Committee.

*British Refractories Research Association.*—It was stated that, as a result of the Joint Appeal sent out under the signatures of the respective Presidents of the National Gas Council and the Institution of Gas Engineers, it was most satisfactory to report that the amount which it was hoped would be raised on behalf of the Gas Industry towards the funds of the Association to enable their research work to

## THE NEWS—*continued.*

continue had already been exceeded. It was desired to convey to subscribing members the thanks of the Presidents of the Council and Institution, respectively, for the ready response which had been accorded to their joint appeal.

*The Sir Arthur Duckham Memorial Fund.*—A letter was submitted from the Institution of Gas Engineers, inviting the Council to nominate two members to serve upon a Committee to consider the inauguration of a Fund in memory of the late Sir Arthur Duckham. The Board nominated Mr. Frank Jones and Alderman Sir William Kay to represent the Council upon the Committee in question.

*Membership of the Board.*—Before concluding the meeting, the Chairman, on behalf of the Central Executive Board, welcomed Col. R. L. Norrington, C.M.G., Chairman of the Plymouth and Stonehouse Gas Light and Coke Company, in place of Mr. J. H. Ellis (retired), and Major G. H. Kitson, Chairman of the Leeds Gas Committee, who now represented the British Commercial Gas Association upon the Central Executive Board.

## Successful Sale of Gosport Gas Stock.

A very large and influential company attended the sale by auction of £10,000 of 5 p.ct. redeemable debenture stock in the Gosport District Gas Company, conducted by Mr. T. Llewellyn Puttock (of Messrs. Llewellyn Puttock & Blake) at the Estate Sale Rooms, " Star Chambers," last week. The stock was offered in £20, £50, and £100 lots.

The auctioneer mentioned that the Company was established 97 years ago, had increased over 110 p.ct. during the past ten years, while a record sale of gas had resulted during the past year showing an increase of over 25 million c.ft. The Company have just taken over the Bishop's Waltham area and villages around, increasing the area of supply from 25 square miles to over 71 square miles in seventeen years. Considerable saving in the working of the Company has been effected recently by sinking their own Artesian well for water supply, and other improvements. The sale of fittings for the past year has beaten all records, amounting to over £12,000, while consumers have increased by over 637 during the year. The revenue of the Company has increased over £4000 during the past year.

The present low bank rate no doubt induced purchasers to take advantage of the opportunity afforded them, as there were buyers and commissions from Bournemouth, Cambridge, Cardiff, Chichester, Horsham, Isle of Wight, Lancashire, Lee, London, Reading, Somerset, Surrey, Sussex, Wales, and Winchester. The total amount of commissions entrusted to the firm totalled no less than £32,170. It was a quick and ready sale, resulting in the whole of the stock selling at highly satisfactory prices of £125; £116 17s. 6d., £115 12s. 6d., £113 2s. 6d., £111 17s. 6d., £110 12s. 6d., £109 15s., £109 10s., £108 15s., £108 10s. per £100, totalling £10,965 10s. for the £10,000. The 130 lots were disposed of in just over an hour.

## Incorporated Sales Managers' Association.

### Annual General Meeting.

At the Annual General Meeting of the Incorporated Sales Managers' Association, held at the Hotel Victoria, London, on the evening of Thursday, Sept. 15, 1932, Sir Francis Goodenough, C.B.E., was elected President for the third year in succession and Mr. H. Pickup was re-elected Chairman.

In his presidential address to the members, Sir Francis Goodenough said: I endorse very fully the satisfaction with which the Council in their Annual Report record the steady progress and development of the Association during the past year, not merely, not mainly, from the point of view of those responsible for its direction and management, but because I believe that progress in the work of the Association means progress towards a sounder and safer state of commerce and industry in this country.

Through its work, and through its endeavours to bring to the notice of the business world the truths proclaimed, the warnings given and the recommendations made, by the Government Committee on Education for Salesmanship—whose report dealt with a great deal more than educational questions; it dealt with fundamental principles of commerce—the Association has succeeded in making the country " selling-minded " to a degree never known before, though still far from what is needed. In every direction one sees the question of " Salesmanship " being discussed, and the word is a familiar one to-day as never in former days.

In this, we may well rejoice. Why? Because we are Sales Managers? Yes; but far more because we are citizens of our beloved country and realize the perils that beset it and what action is necessary if those perils are to be escaped, if the financial stability of the country is to be firmly re-established, and if the future prosperity of our peoples is to be secured.

Let me put the case once more briefly before you. We are a nation whose very life depends upon its commerce—upon our ability to buy from other nations the food and raw materials we cannot produce, by selling to other nations the materials we can produce or manufacture and the services we can provide.

At present—I say it quite deliberately and seriously—our life is in danger. Upon our ability to sell in the world's markets more successfully than at present depends not merely our future prosperity but our future existence as an industrial and commercial nation of first rank. The question is of immediate urgency.

#### Solution of Unemployment Problem.

Upon our ability to sell to other countries more of the products of our mines and factories and more of the services of our merchants, bankers, insurers, and shipowners than we are doing, depends the only satisfactory and lasting solution of our terrific and terrifying unemployment problem.

The situation to-day is certainly brighter than when we met at this time a year ago. Much has been done since the nation was awakened in August of last year to the gravity of its position. We are all proud of our success in " balancing the Budget; " we are all proud of our statesmen's achievements at Lausanne and at Ottawa; but, good as these achievements are, they by no means indicate that our commercial and financial difficulties are at an end. We have yet to balance our trade, not by decreasing imports merely but by increasing our sales to the world outside, or our prosperity will not return nor our unemployed find productive employment.

We may, therefore, well rejoice when we see the truths about the part played by salesmanship in the national economy getting more and more into the minds of the statesman, the business magnate, the man in the street. But they are not yet by any means sufficiently recognized and acted upon. We have, on the one hand, to keep on hammering away with the facts in all directions; and on the other to relax no efforts to make ourselves and our staffs as efficient as possible, so that we may each and all do our bit to lift the wheels out of the ruts and get the wagon moving forward.

We are very proud of the fact that in these efforts we have again received the encouragement and support of the Prince of Wales, who honoured us by addressing our Coming-of-Age Conference in May last. He then expressed his pleasure at being called our " best salesman; " we go further and acclaim him as a great leader of progressive thought in the world of commerce and industry.

Well, we came of age in May, and yesterday we christened our first baby when we gave our blessing to the National Association for Salesmanship. We have now, in the times of stress and strain that lie before us, to show that we can acquit ourselves to the full as men.

Thank you for your support in the past and your renewed proof of confidence in re-electing me again your President.

## The Progress of the Gas Industry.

" The History and Progress of the Gas Industry " was the title of an interesting paper read to the members of the Chertsey Chambers of Commerce at their last monthly meeting by Mr. F. G. Matthews, M.I.Mech.E., Engineer and Manager of the Chertsey Gas Consumers' Company, Ltd., and Chairman of the Chamber.

The existence of gas, Mr. Matthews explained, had been known for more than 300 years, but it was not employed in service until the end of the 18th century. It was William Murdoch, the son of a miller, who was born in 1754, who, at an early age, began to make experiments in the distillation of coal, his first retort being his mother's teapot. Later, at Redruth, he resumed his experiments and lit his office with gas. Every night the villagers crowded round his office, to see the wonderful invention, as an illuminated flame without a wick was a thing previously unheard of.

In 1801 Murdoch returned to Birmingham and erected a small gas-works for lighting his firm's workshops, and that was in fact the foundation of the great Industry which to-day carbonized over 20 million tons of coal annually, and employed about £200,000,000 of capital. In 1852 a German chemist named Bunsen invented the first aerated burner; 30 years later incandescent light was made possible, and with Baron Welsbach's discovery of the mantle they were able to produce the cheapest form of artificial lighting.

# NOTES ON PLANT AND PROCESSES

## The Stanton Iron Road.

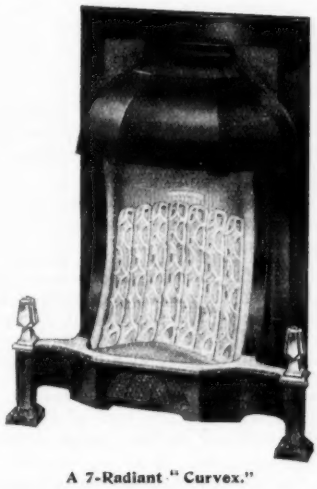
An interesting publication recently issued by the Stanton Ironworks Company, Ltd., near Nottingham, describes and illustrates the firm's iron road, which is specially suitable for yards, docks, wharves, garages and approaches, loading decks, 'bus and coach stations, and a variety of other situations.

The Stanton iron road is made up of $11\frac{3}{4}$-in. square studded cast-iron sections, 2 in. thick, and laid on a concrete foundation. The surface is permanent and stable, and withstands the battering effect of heavy traffic, and the road requires no maintenance. The sections are specially studded, after the fashion of motor-car tyres, giving a definite non-skid surface in all kinds of weather, including frost.

The sections are easily and quickly laid by unskilled labour. They are placed on a concrete foundation which has been thinly coated with bitumen; the joints are then grouted with bitumen, and after a few hours only, the road is ready for use. As the sections are practically self-adjusting, laying costs are lower than with granite setts, and when the iron road is being laid to replace granite setts or wood blocks, the original foundation can be utilized. Special white metal sections are supplied to form permanent white lines. The publication illustrates examples of the road in use and shows clearly how simple a matter it is to lay.

## The "Curvex" Fire.

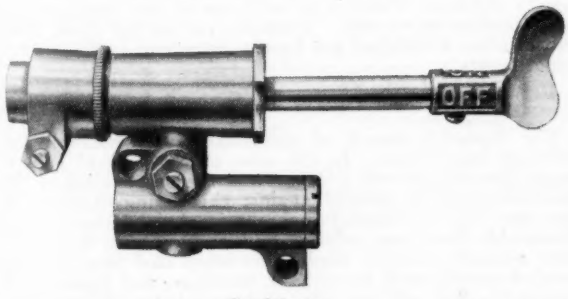
The gas fire illustrated is a new departure in design utilizing a special curved concave radiant in place of the usual straight or convex radiant fitted in a vertical or inclined position.



**A 7-Radiant "Curvex."**

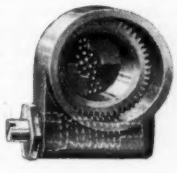
In the "Curvex" fire, which is made by the Parkinson Stove Company, Ltd., the flame is inclined backwards and naturally follows an upward curve. Since the curve of the radiant corresponds with that of the flame, it is possible to use radiants of greater length and so, it is claimed, secure better utilization of the heat.

Approximately 90 p.ct. of the total radiant heat emitted from the inset pattern is directed above floor level, and so the possibility of floor scorching is eliminated and a more uniform distribution of the heat throughout the room is secured. Sufficient heat is thrown downwards, however, to maintain satisfactory floor warmth.

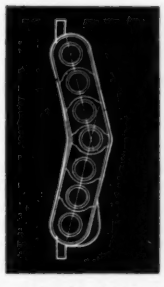



**Gas Injector.**

The Simplex Injector fitted to the "Curvex" enables the mixture of gas and air to be easily and quickly adjusted. The Injector is an instrument of precision.



This illustration shows the non-jamming geared worm drive for fine adjustment of gas volume, ensuring perfect mixture and silent combustion.



Plan of the horizontal curve of the radiants at bottom, permitting wide side distribution of heat.

The specially curved radiant fitted to the "Curvex" fire is shown pictorially above. The curve has been scientifically designed to give the most effective vertical distribution of heat, while the centre radiants are placed further forward than the side radiants to give the widest side distribution of heat.

A noteworthy feature of this fire is the large amount of heat radiated from side to side on to the wall behind the fire. Approximately 29 p.ct. of the radiant heat is emitted between 60° and 90° E and W of normal—*i.e.*, from the front centre of the fire.

Our readers will be impressed with the engineering precision of the gas injector with its "non-jamming" worm-gear adjustment to ensure perfect combustion with the silent burner.

The "Curvex" already promises to be an exceedingly popular gas fire. It catches the imagination and satisfies the most critical consumer.

## Wright's New Winter Lists.

The new winter lists of Messrs. John Wright & Co. (Radiation, Ltd., Proprietors), of Essex Works, Aston, Birmingham, which have been forwarded to us, are extremely well-produced publications, with particularly attractive cover plates in colour.

The catalogue of the firm's "Classic" range of gas fires, with its supplement on the "Sunsheen" colour finishes in which they can be obtained, directs special attention to the many beautiful designs and finishes, suitable for any scheme of decoration. In the "Tone" series are represented the most popular of the various colour finishes which the firm have produced in recent years, including various bronze finishes, marble finishes, and the novel Chinese lacquer finishes. The "Tone" series is fully illustrated in colour in their booklet A 2690. Produced by a special process, these finishes have a brilliance and sheen which is very beautiful, and a high gloss which enhances the rich tones of the various colours and ensures their permanence. "Sunsheen" and "Tone" colour finishes will be just as delightful years hence, it is claimed, as they are to-day. The wrought-metal fires are distinctive in that the fronts are of wrought metal skilfully overlaid by master craftsmen. Wrought copper, brass, and an attractive pewter finish make up the ever popular wrought metal series.

Other new lists by Messrs. John Wright include one in reference to their "Regulo"-controlled radiators—many models of which are fully described and illustrated—and another dealing with their new "Console" cabinet radia-

tor, which is available in a number of charming finishes—old brass tone, old copper tone, and moorland green. In the latter finish, the mesh-work panels are relieved with a rich old gold colour. There are also two wood grain finishes—mahogany and walnut, both faithful reproductions of these woods.

## Air Blowing Fans.

A new publication by Messrs. James Keith & Blackman Company, Ltd., of 27, Farringdon Avenue, E.C. 4, describes and illustrates types of the firm's air blowing fans for oil and gas fired furnaces.

Blowing fans for air service to burners fired by oil or gas should, for efficient combustion, possess a characteristic ensuring a steady pressure entirely free from pulsation or surging. When direct driven from alternating current motors, fans require impellers of special design in order to maintain a steady pressure throughout a wide range of volumes.

The fans dealt with in this publication have been designed to meet these requirements, and are claimed to maintain a steady flame for single or multi-burner work. The outputs of the fans are based on the speeds available with a 2-pole motor on standard alternating current supply of 50 cycles per second—*i.e.*, 2900 r.p.m. Other volumes and pressures are practicable on direct current supply with no speed restrictions.

Other recent publications by the same firm deal with paddlewheel fans, industrial gas heating systems, and the "Keith" thermostat gas controller.

This gas controller is for use where it is found necessary or desirable to maintain, within close limits, the temperature of a fluid heated by gas. There are two main types, the governor type and the non-governor type, and they are stated to maintain the desired temperature within 3° Fahr., and can be arranged to control up to 700° Fahr. either on ordinary low-pressure gas supplies or on high-pressure supplies. A standard size of the governor and thermostat combination is the 1¼ in., which is suitable for a gas consumption on low pressure up to 400 c.ft. per hour, and on high-pressure up to 1200 c.ft. per hour.

# "Colloidal Fuel"

[Contributed.]

The use of a mixture of oil and finely powdered coal in one of the boilers of the Cunard liner "Scythia" during a recent trial run to New York has renewed interest in the subject of "colloidal fuel." The fuel used on this occasion consisted of a mixture of 60 p.ct. ordinary fuel oil and 40 p.ct. finely pulverized coal, the size of the latter being so small as to permit the mixture being regarded as colloidal. The coal oil mixture—the specific gravity of which was given as 1·1—was being used under similar conditions as the crude oil, and on the return of the boat from New York it was reported that very satisfactory results had been obtained. No sedimentation had occurred and "perfect combustion" had been maintained throughout. As regards the financial aspect it has been stated that with oil at 60s. per ton and coal at 12s. per ton a saving of about 20s. per ton should be effected, but this does not apparently take into account the cost of grinding.

The re-introduction of the subject of "colloidal fuel" recalls the comprehensive investigations which were carried out on this subject in America towards the end of the war. This work was initiated on account of the submarine menace to the fuel oil supplies of this country, and pulverized coal was suggested as a substitute. Although this was shown to constitute a satisfactory fuel it was not a practical proposition, owing to the fact that it involved a reduction of about 50 p.ct. in the storage capacity of a ship. In view of this, Lindon Bates, in whose hands the investigation was placed, decided to explore the possibilities of incorporating coal with oil—a process which had already been tentatively examined. After considerable experimental work it was found that coal, in quantities up to 40 p.ct., could be mixed with petroleum oil, the mixture being sufficiently stable for use as marine fuel oil. The product to which the term "colloidal fuel" was applied was not strictly speaking a colloidal suspension. Part of the coal could be regarded as being in a state of true solution, part in colloidal solution, and the remainder as even larger particles. For particles to be present in true solution it may be considered that, for practical purposes, their diameter must not exceed $1 \times 10^{-7}$ cm.—although authorities differ on this question. Between this value and a size of $1 \times 10^{-5}$ cm. is the range of colloidal solution, while larger particles are present in simple suspension. Although a suspension of particles in a liquid may be regarded as relatively stable if the particles lie within the above colloidal limits they may in some cases be precipitated in the presence of electrolytes. The addition of what are termed "protective colloids" prevents this precipitation, and in some cases this procedure stabilizes suspensions of particles greater than colloidal size. Such stabilizing substances are gelatines, glues, casein—to mention only a few. In the American experiments the coal was ground to give approximately the following screen analysis:

| | | | |
|---|---|---|---|
| Through 100 mesh | (average size 0·01 cm.) | . . | 95 p.ct. |
| ,, 200 ,, | ,, 0·005 ,, | . . | 85 ,, |
| ,, 300 ,, | ,, 0·003 ,, | . . | 80 ,, |

From the above figures it will be seen that a considerable proportion of the powdered coal was greater than colloidal size, and it was therefore necessary to add some stabilizing agent. The term "fixateur" was applied to this material, which in the above experiments was a lime-resin soap or grease. The quantity required was small, varying from ½-2½ p.ct. according to the proportion of coal used. Thus the composition of a typical colloidal fuel was given as:

| | |
|---|---|
| Navy fuel oil (Texas) . . . . . | 66 p.ct |
| Bituminous coal . . . . . | 30 ,, |
| Sawdust . . . . . | 2 ,, |
| "Fixateur" . . . . . | 2 ,, |

With regard to the properties of this product, its density and calorific value will naturally vary according to the proportion of coal and oil which are used thus:

| | |
|---|---|
| If specific gravity of oil . . . . . | = 0·96 |
| the specific gravity of 80 p ct. oil + 20 p.ct. coal . | = 1·05 |
| and the specific gravity of 60 p.ct. oil + 40 p.ct coal | = 1·14 |

The increased specific gravity of the colloidal mixture is particularly valuable for marine purposes and has the added advantage of allowing the oil to be quenched by water and also stored under water. The flash point is low, being given as 200° Fahr. The calorific value per gallon of mixture is greater or less than that of the original oil according to the difference between the calorific value of the coal and the oil. The viscosity of the mixed fuel is stated to be similar to that of ordinary heavy-grade fuel oil and no alterations in apparatus are involved in the change from one fuel to another.

In regard to the efficiency of use in boilers comparative tests with heavy fuel oil and colloidal fuel were carried out in an American vessel, the results obtained indicating that a slightly higher efficiency was attained with the latter. Similar results were obtained in land boilers. As previously stated, this work was carried out in 1919, but, in spite of the favourable reports published and the excellent results obtained, there is no evidence of any further progress having been made. Possibly, on further trial, difficulties arose which had not been encountered in the earlier experiments.

### A New Outlet for Tar Oils?

The financial aspect of the question is naturally of primary importance. In the case of the Cunard experiment, the cost of coal grinding and the preparation of the mixture must be debited against the saving obtained of 20s. per ton of colloidal fuel. It is obvious that a coal reasonably free from sulphur and preferably of low moisture content must be used. Powdered coal may be suspended equally well in coal tar fractions, and mixtures of petroleum fuel oil, tar oils, and coal have already been used and found to give satisfactory results. Thus a new outlet is opened for tar oils the possibilities of which should be thoroughly investigated.

# THE "JOURNAL" TECHNICAL RECORD

*Which contains Reports of Meetings of Gas and Allied Associations*

## The Planning of Gas Installations to Conform with the British Standard Specification for Street Lighting

By FREDERICK C. SMITH, Assoc.M.Inst.Gas E., of the Gas Light and Coke Company.

*An extract from a paper before the Association of Public Lighting Engineers, Sept. 7, 1932. Considerations of space render it quite impossible to reproduce the Appendices to the paper, though, for clarity, references to the Appendices are retained. Examples are given which will enable our readers to gain a true idea of this important contribution. The paper was prepared under the auspices of the Institution of Gas Engineers, and is obtainable from the Secretary of the Institution, price* 1s. 6d.

It is recognized that many surveyors have not the time, or the information required, to make the calculations necessary in order to arrange street lighting schemes, and it is hoped that the data given will be of value to them in assessing the relative merits and the economics of schemes presented to them for consideration.

The first object has been to tabulate the essential data for a series of street lighting schemes designed to conform with the requirements of the British Standard Specification for Street Lighting (1931). Full details of these lighting schemes are contained in Appendix (3), in which they have been developed for a staggered system with units overhung over the carriageway, a staggered system with units mounted on columns on the kerb, and for units centrally suspended. [An example of the schemes detailed in Appendix (3) is given later.]

The following data are given for each of the schemes: Classification; formation; mounting height; spacing; spacing height ratio; unit required; gas consumption in c.ft. per hour (500 B.Th.U. gas); gas consumption per 1000 sq. ft. of roadway illuminated, per hour.

In some cases the average illumination to be anticipated on the carriageway and footway has been calculated by the method outlined on pages 22 and 26 of the British Standard Specification for Street Lighting.

The second object has been to outline a simple method for the development of street lighting schemes, and in this connection a series of curves is given in Appendix (2). It is hoped that these may prove of value to public lighting engineers, and when used in conjunction with the usual distribution curves, such as those given in Appendix (1), they simplify the designing of street lighting schemes. [We give examples of the curves in Appendices (1) and (2).]

The schemes referred to in Appendix (3) are designed to bring about the *rated illumination* at the test-point, with the gas rate quoted, which in practice can be maintained within very narrow limits if well-designed governors are employed. Experience has shown that where reasonable maintenance is available the illumination at the test-point will always be well in excess of *service* requirements.

The following Tables are abstracted from the British Standard Specification for Street Lighting. In no case do the schemes utilize lower mounting heights than those recommended in column 3 of Table I. Similarly, in the majority of cases schemes have been included to conform with the requirements in regard to spacing height ratios recommended in column 3, Table II., above. In no case, however, does the spacing height ratio exceed the maximum referred to in column 2 of the same Table.

TABLE I.—*MOUNTING HEIGHTS,*

*being an Extract (Table II) from the British Standard Specification for Street Lighting, 1931, page 10.*

| Class. | Rated Mean Test-Point Illumination on Carriageway. | Height of the Luminous Centre of the Light Source Above the Ground. | |
|---|---|---|---|
| | | Minimum. | Lowest Recommended. |
| 1 | 2 | 3 | 4 |
| A | 2·0 foot candles and upwards | 30 ft. | 30 ft. |
| B | 1·0 foot candle. | 25 ,, | 27½ ,, |
| C | 0·5 ,, | 21 ,, | 25 ,, |
| D | 0·2 ,, | 18 ,, | 21 ,, |
| E | 0·1 ,, | 15 ,, | 18 ,, |
| F | 0·05 ,, | 13 ,, | 15 ,, |
| G | 0·02 ,, | 13 ,, | 13 ,, |
| H | 0·01 ,, | preferably 13 ft. | 13 ,, |

TABLE II.—*SPACING HEIGHT RATIOS,*

*being an Extract (Table III) from the British Standard Specification for Street Lighting, 1931, page 10.*

| Class. | Maximum. | Recommended. |
|---|---|---|
| 1 | 2 | 3 |
| A | 5 | Not more than 3 |
| B | 6 | ,, ,, ,, 4 |
| C | 8 | ,, ,, ,, 5 |
| D | 9 | ,, ,, ,, 6 |
| E | 10 | ,, ,, ,, 7 |
| F | 12 | ,, ,, ,, 8 |
| G | 12 | ,, ,, ,, 10 |
| H | 12 | ,, ,, ,, 10 |

The schemes contained in Appendix (3) are only representative of the many possible combinations of the various types of gas units available, of the possible formations, permissible mounting heights, &c.

### BRITISH STANDARD SPECIFICATION AND GOOD LIGHTING.

In this paper the British Standard Specification has been taken without comment, and schemes have been arranged to fit its requirements. The author believes that the Committee responsible for drafting this Specification would not claim finality for it, and it is within his knowledge that efforts are being made from time to time to revise the Specification in order to make it a more equitable basis for tender and to ensure that lighting schemes which result from its application shall promote the highest visibility in the streets.

The Gas and Electricity Industries, together with other lighting authorities, are jointly responsible for the present Specification and together are seeking from time to time to revise its provisions. In general, however, it would seem a fair statement that the present Specification assumes a very close relationship between visibility and horizontal illumination on the road surface. It advocates the avoidance of glare and seeks to provide a fairly even illumination over the road surface. There are, however, other factors in regard to visibility which are undoubtedly of importance, and therefore it must not be assumed that schemes based entirely on horizontal illumination are of necessity the best to promote the highest visibility.

### DISTRIBUTION CURVES FOR STREET LIGHTING UNITS.

Appendix (1) contains twenty-five diagrams showing distribution of luminous flux from both high and low pressure units with and without the various forms of directional reflectors. In cases where the sources are reasonably symmetrical the familiar polar distribution curve showing the distribution of light in the upper and lower hemisphere is

given. In the case of units where the distribution is asymmetric, isocandle diagrams are provided.

Sinusoidal projection has been adopted for the isocandle diagrams. This method of projection is extremely useful as it enables the average illumination on the carriageway and footway to be calculated with comparative ease. On each of the diagrams will be found the following data:

(i) Gas rate in c.ft. per hour (500 B.Th.U. gas).
(ii) Mean lower hemispherical candle-power.
(iii) Luminous flux in lower hemisphere in lumens.
(iv) Total luminous flux in lumens.
(v) Mean lower hemispherical candles per c.ft. per hour.
(vi) Total lumens per c.ft. per hour.
(vii) Ratio $= \frac{\text{Luminous flux in lower hemisphere}}{\text{Total lumens}}$

It is a debatable point as to which is the most useful method of expressing the efficiency of a light source for street lighting purposes. In this paper data have been given which should enable these efficiencies to be calculated in a manner thought most desirable by those using the curves. There can be little doubt that statements of efficiency in terms of " total lumen output per unit of energy " without reference to the direction in which the flux is projected, and is to be utilized, are inadequate and may be distinctly misleading.

### Class of Illumination and Type of Thoroughfare.

As is well known, the British Standard Specification for Street Lighting gives no guidance in regard to what might be considered suitable illumination for the conditions prevailing in a given thoroughfare. In this connection it is worth noting that valuable work is being done by Mr. Harold Davies (Chesterfield) and Mr. W. J. Jones, of the E.L.M.A., who are co-operating in order to provide municipal engineers with guidance in this matter. The Joint Lighting Committee of the Institution of Gas Engineers has had the opportunity of considering the preliminary drafts containing these proposals, and has expressed itself satisfied in principle with them. It is recognized that the proposals will have to be amplified by more complete definition in order to be of the greatest value.

The author has attempted in Appendix (4) [omitted from our extract] with a knowledge of the British Standard Highway Illumination Class of certain well-known thoroughfares in the area of the Gas Light and Coke Company, to classify such thoroughfares in accordance with these proposals, and has given the class of gas installation actually in use, which class in some cases does not reach that proposed.

In general it may be said that the proposals fit in well with accepted good practice, and there is little doubt that some such classification is likely to prove very useful.

### Development of a Street Lighting Scheme.

#### *Formation.*

When the lighting authority has decided upon the class of lighting to be provided in a given thoroughfare, and when the distribution curves for the units under consideration are available the question of formation has to be decided. If the scheme is entirely new the actual formation has to be planned, while if, on the other hand, it is what may be termed a " conversion scheme," then in all probability the formation is determined already by the position of the existing columns.

In cases other than " conversion schemes," the following notes of the main arrangements available may be of value:

Formation 1. Staggered arrangement, lamps (*a*) overhung over the road surface or (*b*) mounted on columns on the kerb.
Formation 2. Arranged in pairs, overhung over the road surface.
Formation 3. Centrally suspended or mounted on columns in centre of carriageway.
Formation 4. Single sided lighting, lamps overhung or mounted on columns on kerb.
Formation 5. Alternate pairs and centre lighting or other similar formations.

In certain arterial roads special formations are often the practice, but in this paper Formations 1 (*a*) and (*b*) and 3 only are considered.

Formation 1 is very widely used in continental cities, and is frequently being adopted in this country for new schemes. It is useful for lighting fairly wide carriageways, especially where there is a double traffic stream on both sides of the road. In the case of roads giving marked specular reflection, there is the additional advantage that the resulting " lanes of light " are located directly in the course of the motorist for whom visibility is increased by virtue of the light background provided.[1] In providing for such a system it is useful to arrange for gear which will enable the lamp to be drawn in and lowered for maintenance so that the traffic is not inconvenienced by the tower ladders used for this purpose.

The staggered formation with the lamps mounted on columns on the kerb is commonly found in residential streets. It is questionable whether this method would be adopted for main thoroughfares where new layouts are being considered.

Formation 2, in cases where the width of the road is not too great to bring in engineering difficulties, has much to commend it. It has been utilized with good results by the electrical engineers on the Victoria Embankment in London, and is, of course, equally applicable to gas units. In some arterial roads the lamps are arranged in pairs on opposite kerbs. This, however, is a somewhat uncommon arrangement.

Formation 3 is a desirable arrangement for all but the very widest streets—especially where fast moving traffic has to be considered. It has the following advantages:

(*a*) Shadows caused by vehicles across the road surface are shorter than is the case with some other formations.
(*b*) As in the case of Formation 1, the " lane of light " from each lamp falls wholly on the road and the average brightness is therefore considerably augmented when compared with the staggered system.
(*c*) This system for a given spacing height ratio is most economical in so far as a greater proportion of the flux is utilized on the road surface than with any other system. When expense permits, the lamps, if suspended, should be arranged with gear so that they can be drawn in to the footway for maintenance purposes. It is sometimes stated that, where lamps are suspended from wires on posts specially provided, the effect is unsightly, and where buildings are available and permission can be obtained, it is desirable from this point of view to fix the wires to the buildings.

Formation 4, a single-sided arrangement, in general is not to be recommended. It has its application, however, in certain very special cases, and for the purposes of calculation it may be considered as a special case of central suspension.

Formation 5 is useful for wide thoroughfares where the higher classes of illumination are to be provided. A somewhat similar system for which high-pressure gas units are utilized is at present in use in Regent Street.

#### *Choice of Mounting Height and Spacing.*

The planning of the installation has now reached this stage:

(*a*) The class of illumination to be provided has been specified.
(*b*) Distribution curves for suitable units are available.
(*c*) The formation of the light sources has been decided upon.

A plan of the street is probably available, or in the absence of a plan the widths of the carriageway and footway can be measured. In addition, it is necessary to note whether the street is straight or otherwise as these conditions influence the spacing.

#### *Mounting Height.*

It is usually desirable to consider at least three different mounting heights in order to arrive at the most desirable arrangement.

These are normally selected as follows:

(*a*) " Minimum " from column 3 of Table II., British Standard Specification for Street Lighting (see Table I. of this paper).
(*b*) " Lowest recommended " from column 4 of the same table, and
(*c*) Some height greater than (*b*) by, say, 3 ft.

If, however, practical conditions (such as the height of traffic passing under the lamp) make one or more of these impracticable, it is necessary to replace them in the tentative scheme by one or more stages higher than (*c*).

#### *Spacing Height Ratio.*

The upper limit for the spacing height ratio is established in Table III. in the British Standard Specification for Street Lighting—Table II. of this paper. Whether the " recommended ratio " stated in the same table can be realized is very largely a matter of cost.

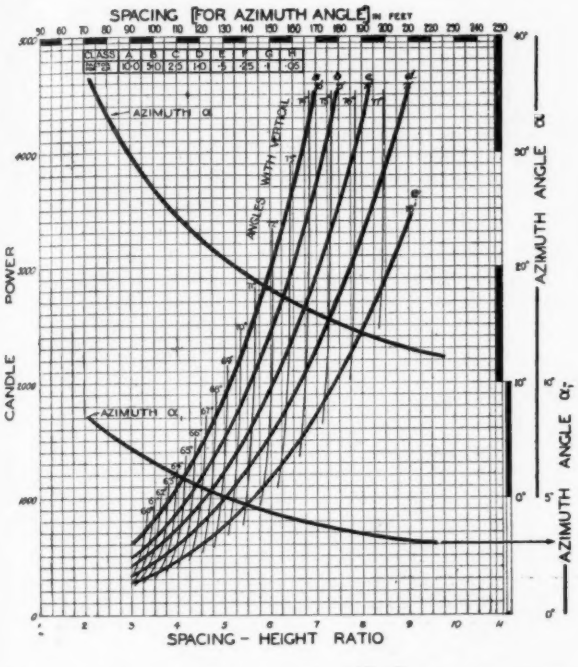
It should be emphasized that the greater spacings are not

[1] In this connection see " Street Surfaces and Public Lighting," by S. B. Langlands, read at the 59th Annual Meeting of the Institution of Municipal and County Engineers.—" Journal of the Institution of Municipal and County Engineers," Vol. LIX., No. 3, pages 182-223.

practicable when very winding roads are under consideration.

*Use of the Curves in Appendix* (2).

The left-hand ordinate of Curve A is a scale of candle powers, and on the corresponding abscissa will be found spacing height ratios.




CURVE A.—*Extracted from Appendix* (2) *for the purpose of illustrating the method of obtaining* (*a*) *candle power;* (*b*) *vertical angle;* (*c*) *azimuth angles.*

The curves marked *a*, *b*, *c*, *d*, and *e* indicate *half* the *total* candle power required for the various spacing height ratios to produce Class D illumination at the test point for mounting heights of 30, 27, 24, 21, and 18 ft. respectively.

In the top left-hand corner of the curve is a table giving a series of multipliers to be used to calculate the necessary candle power to produce the required illumination at the test point for any class from A to H.

*Illustration.*

An illustration will probably assist.

"Required to determine the candle power necessary to produce Class D illumination from a source mounted 21 ft. high, the spacing height ratio being 5, width of carriageway 30 ft., units overhung 6 ft., and arranged in staggered formation."

The appropriate diagram is Curve A. Reading off on the candle-power scale for spacing height ratio 5 for curve *d* a candle power of 1000 is indicated as necessary to produce half the required illumination. The total candle power required is therefore 2000. This candle power may be contributed to by two or more sources according to the spacing and formation of the system. In general, for the formations considered in this paper, and for Classes from H to C inclusive it is considered that only two sources are contributing.

It is hardly necessary to remark that the candle power required need not be equally contributed by each source. In the illustration a precisely similar illumination would be obtained at the test point if one source was contributing a luminous intensity of X and the other Y so long as X + Y = 2000.

If, however, it should be required to produce the illumination at the test point for a Class E street the candle power required for Class D must be multiplied by the appropriate factor (from the Table at the top of the curve) which

in Class E = 0·5.
and for Class G = 0·1.

Further, in order to determine the appropriate candle power available from any given source of light, reference must be made to the distribution curves in Appendix (1), and for this purpose it is necessary to know the angle that the ray joining the source with the test point makes with the vertical.

Referring again to the Curve A, a series of 18 lines will be observed intersecting the curves *a*, *b*, *c*, *d*, and *e*, and these enable the vertical angle to be determined.

Again referring to the illustration, stepping up the spacing height ratio of 5 on to the curve *d*, it will be noted that the point so obtained occurs between the intersecting lines marked 69° and 70°.

*Azimuth Angles.*

In the case of a source having a symmetrical distribution about a vertical axis it is unnecessary to consider the azimuth angle. In Appendix (1), where sources have a symmetrical distribution, the ordinary form of polar curve has been employed, but for asymmetrical distribution iso-candle diagrams are utilized. For sources with an asymmetrical distribution it becomes necessary to determine the azimuth angles. These are referred to as $\alpha$ and $\alpha_1$, in the curves given in Appendix (2).

*Determination of Azimuth Angles from Curves in Appendix* (2).

At the top of the Curve A will be found a chequered scale marked "spacing" (for Azimuth angle) in feet, and on the right side two chequered scales marked "Azimuth $\alpha$" and "Azimuth $\alpha_1$."

It should be noted that for staggered formation and lamps overhung over carriageway it is necessary to determine both $\alpha$ and $\alpha_1$, whereas for staggered formation lamps mounted on columns on kerb the value of $\alpha_1$ will always be 0°. For centrally hung systems only azimuth $\alpha$ has to be determined, hence on curves for staggered formation lamps mounted on columns on kerb and for centrally hung formation, only one curve for azimuth angle $\alpha$ is necessary.

Returning again to the illustration for a spacing height ratio of 5, mounting height 21 ft., the procedure is as follows:

Spacing = Spacing height ratio × mounting height
105 = 5 × 21.
Step off 105 ft. on the top scale marked "Spacing," and read off the corresponding angle from the azimuth $\alpha$ curve on the right-hand scale,
$\alpha$ = 26°.
Similarly, reading off from the $\alpha_1$ curve,
$\alpha$ = 6°.

*Completing a Lighting Scheme.*

The method of completing a lighting scheme is best illustrated by reference to a particular case.

*Illustration.*

Required to produce Class E illumination given:

Width of street—30 ft.
Formation—Staggered lamps overhung 6 ft. over carriageway.
Mounting height—"Lowest recommended," also lowest practical = 18 ft.
Unit selected (see Appendix (1)) ... ... No. 17.
Spacing height ratio—"Maximum permissible = 10."
Spacing height ratio—"Maximum recommended—not more than 7."

From Curve A determine the following values for spacing height ratios 5, 5½, 6, 6½, and 7, and tabulate figures as follows:

TABLE III.—*Tabulation of Data from Curve A.*

| Spacing Height Ratio. | Candle Power Required. | | | Vertical Angle θ. | Azimuth Angles. | |
|---|---|---|---|---|---|---|
| | Curve Reading for Class D. | Factor. | Total C.P. Required for Class E | | α. | α1. |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5 | 780 | 2 × 0·5 | 780 | 69½° | 30° | 7½° |
| 5½ | 950 | 2 × 0·5 | **950** | 71½° | 27° | 6½° |
| 6 | 1180 | 2 × 0·5 | 1180 | 72½° | 25° | 6 ° |
| 6½ | 1430 | 2 × 0·5 | 1430 | 73½° | 22° | 5½° |
| 7 | 1730 | 2 × 0·5 | 1730 | 74½° | 21½° | 5½° |

Referring to Distribution Curve for Unit No. 17 in Appendix (1), Table IV., may now be completed.

Comparing these two tables, it is evident that with a mounting height of 18 ft., and spacing height ratio of 5½, the requirements for Class E can be satisfied.

In a similar manner any other Scheme may be developed. It should be noted, however, that if more than

TABLE IV.— *Tabulation of Data from Curve A and Curve 17.*

*Columns 1, 2, and 3 from Table III above.*
*Columns 4, 5, and 6 from Curve 17 of Appendix (1).*

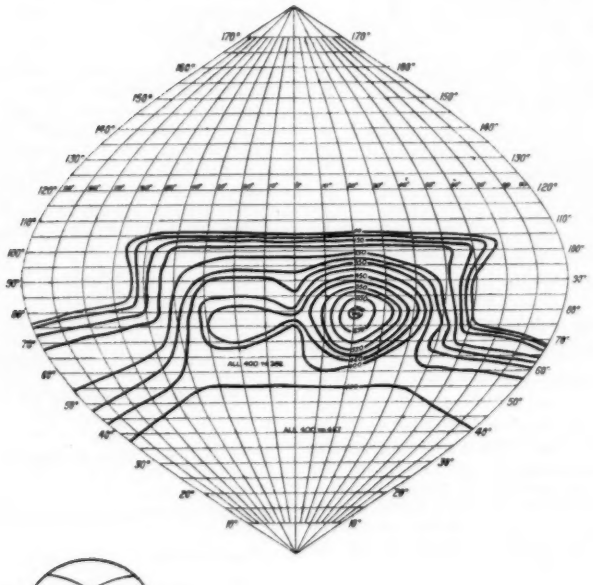
| Vertical Angle $\theta$. | Azimuth Angles. $a$. | Azimuth Angles. $a_1$. | Candle Power at Vertical Angle $\theta$ and Azimuth Angle $a$. | Candle Power at Vertical Angle $\theta$ and Azimuth Angle $a_1$. | Total C.P. from Unit in Required Direction. |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 69½° | 30° | 7½° | 510 | 380 | 890 |
| 71½° | 27° | 6½° | 560 | 390 | 950 |
| 72½° | 25° | 6° | 600 | 380 | 980 |
| 73½° | 22° | 5½° | 625 | 380 | 1025 |
| 74½° | 21½° | 5½° | 650 | 460 | 1110 |

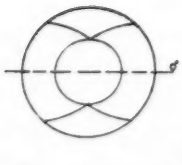
(*b*) Value of the maximum and average illumination on the carriageway. The average illumination to be calculated by a method to be agreed by the purchaser. One method for calculating average illumination is shown in Appendix IV. (of the Specification).
(*c*) The luminous output of the light sources necessary to provide the illumination required.
(*d*) The type, rating, and total number of gas burners or electric lamps to be used.
(*e*) For a gas installation, the consumption of gas per hour for the complete installation, (i) for burner, (ii) with by-pass, if any."

In regard to (*a*), the light distribution curves for the units used in this paper are given in Appendix (1), and these have already been utilized in arriving at the conditions necessary to bring about a given class of illumina-

NO. 17 UNIT.—DISTRIBUTION CURVE (*Appendix* (1).

***5.C Mantles, Low Pressure, arranged in cluster and fitted in Suspension Lamp with 22 in. White Enamelled Top Reflector with Clear Globe and one 3-tier and one 2-tier Staybrite Steel Directional Reflectors.***





PHOTOMETRIC DATA.

| No. of Unit. | Gas Rate in C.Ft. per Hour, 500 B.Th.U Gas. | Candle Power, M.L.H. C.P. | Flux in Lumens. Lower Hemisphere. | Flux in Lumens. Total. | Efficiency. M.L.H Candles. Per C.Ft. Per Hour. | Efficiency. Total Lumens, Per C.Ft. Per Hour. | $R = \frac{\text{Lumens (Lower Hemisphere)}}{\text{Total Lumens}}$ |
|---|---|---|---|---|---|---|---|
| 17 | 12·5 | 363 | 2278 | 2525 | 29·0 | 202 | 0·9 |

two sources are contributing to the test point a slight modification in this method is essential.

*Conversion Schemes.*

In the case of a conversion scheme the spacing is determined by existing practice and, if the mounting height is arranged, reference to the suitable curve in Appendix (2) will readily enable the candle power required, and the angles at which this candle power must be developed to conform with any classification, to be determined.

INFORMATION REQUIRED BY THE BRITISH STANDARD SPECIFICATION FOR STREET LIGHTING.

The British Standard Specification for Street Lighting states[2] that the following particulars shall be given, with the tender, for information only:

" (*a*) Such light distribution curves of the fittings proposed as will enable an estimation to be made of the distribution of the light on the carriageway and on the footway.

[2] British Standard Specification for Street Lighting, 1931, page 13.

tion, but they are also required to enable an estimate to be computed of the distribution of the light on the carriageway and footway.

Probably the best way of doing this is to construct an isolux diagram for a unit of the formation employed. This is a fairly simple matter if only two sources of light are contributing to the illumination at the test point—especially if the light sources have a symmetrical distribution about a vertical axis. It is somewhat complicated and tedious, however, if the illumination is contributed to by more than two sources of light, and is especially complicated if the distribution about the vertical axis is not symmetrical. The latter condition has nearly always to be faced when directional reflectors are in use.

THE DEVELOPMENT OF ISOLUX DIAGRAMS.

*Illustration.*

In order to illustrate the method used in this paper for the development of the isolux diagram, the various stages are shown in the preparation of an isolux diagram for a street of width 40 ft., lighted by units mounted 18 ft. above

the road on columns on the kerb, arranged in staggered formation. The spacing height ratio is 7, and the unit is No. 19 (Appendix (1)).

The horizontal illumination from a source is given by the well-known equation—

$$E_h = \frac{J \cos^3\theta}{H^2}$$

Where J = candle power.
$\theta$ = angle with vertical.
H = mounting height in ft.

It will be observed that the unit chosen has an asymmetrical distribution about the vertical axis.

base of the column and also the illumination from unit candle power mounted 18 ft. high.

From fig. 1 Angle $\theta = 29°$.

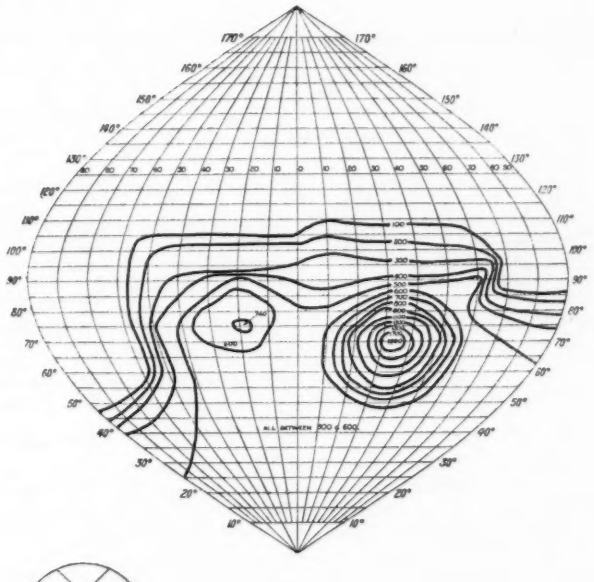
$$\text{Illumination Factor} = \frac{\cos^3\theta}{H^2} = 0{\cdot}002$$

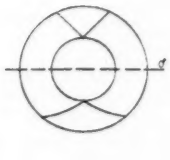
From the Distribution Curve of Unit No. 19 of Appendix (1), the candle power at 29° vertical and 0° azimuth = 504 candles.

∴ Illumination at 0° in fig. 2 and at 10 ft. from the source
= 0·002 × 504 ft. candles.
= 1·0 ft. candle approx.

No. 19 Unit.—Distribution Curve (*Appendix* (1)).

*7.C Mantles, Low Pressure, arranged in cluster and fitted in Suspension Lamp with 30 in. White Enamelled Top Reflector and one 3-tier and one 1-tier Mirror Glass Directional Reflectors.*





PHOTOMETRIC DATA.

| No. of Unit. | Gas Rate in C.Ft. per Hour, 500 B.Th.U Gas. | Candle Power, M.L.H. C.P. | Flux in Lumens. | | Efficiency. | | $R = \frac{\text{Lumens (Lower Hemisphere)}}{\text{Total Lumens}}$ |
|---|---|---|---|---|---|---|---|
| | | | Lower Hemisphere. | Total. | M.L.H Candles. Per C.Ft. Per Hour. | Total Lumens. Per C.Ft. Per Hour. | |
| 19 | 17 5 | 544 | 3415 | 3750 | 31·1 | 215 | 0·91 |

In the first case the curve shown in fig. 1 was obtained, the value for H being 18 ft.

It is evident that such a curve represents the illumination at any point on the road surface from a source of unit candle power in all directions, mounted 18 ft. above the surface to be illuminated, and also that the scale of angles enables the corresponding value for the angle between the line joining the particular point to the source and the vertical to be computed.

The line representing the distances along the road from the column to the point has been drawn to a similar scale to that used in the road plan upon which the isolux diagram was constructed.

The next stage is shown by fig. 2, which consists of a series of concentric circles, the radii increasing progressively by 1 in. The angles shown have the same significance as the azimuth angles on the isocandle diagrams. Thus 0° in fig. 2 corresponds to 0° azimuth on the isocandle diagram, and so on.

From fig. 1 may be read off the vertical angle $\theta$ corresponding to a distance of 10 ft. along the road from the

In a similar manner the illumination at various distances from the foot of the column and at various azimuth angles was calculated and the values inserted in the appropriate places in fig. 2.

Next all points in fig. 2 where the illumination was equal to 1·5 ft. candles were joined, a similar procedure was adopted for values of 1·0, 0·5, 0·25, 0·1, 0·075, 0·05, 0·04, 0·03, 0·02, and 0·01 ft. candles.

Fig. 3 is the resultant isolux diagram for the Unit 19 when mounted 18 ft. above the road surface.

Fig. 4 is a scale plan of the road with the position of the sources indicated by the circles. On this diagram has been indicated the isolux diagram for a single source obtained from fig. 3.

If the road plan is drawn on tracing paper and placed over fig. 3 in such a manner that the centre of fig. 3 is coincident with the position of the sources, and the line marked 0° on the diagram is also made to coincide with the kerb line on the road plan the appropriate isolux lines may be traced on to the road plan and fig. 4 is obtained.

Fig. 5 is obtained in a similar manner; in this case the

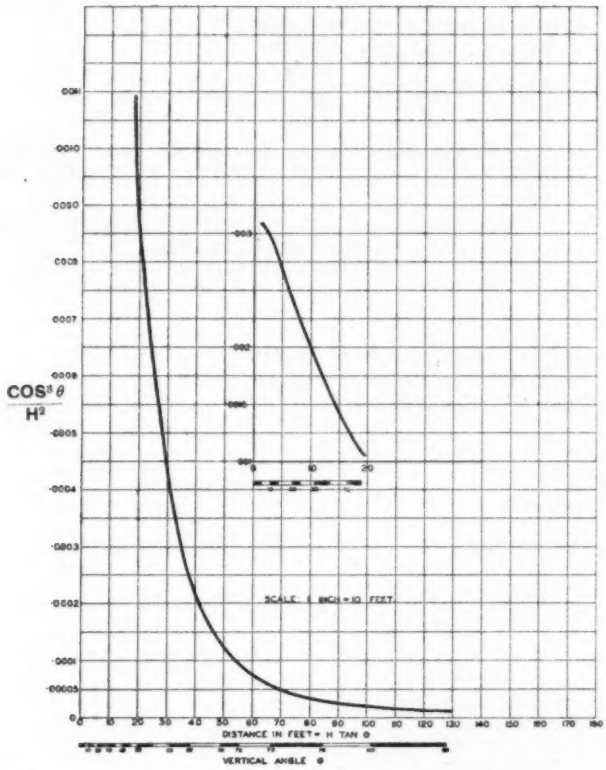



FIGURE 1.—*Illumination curve for source of unit candle power.*

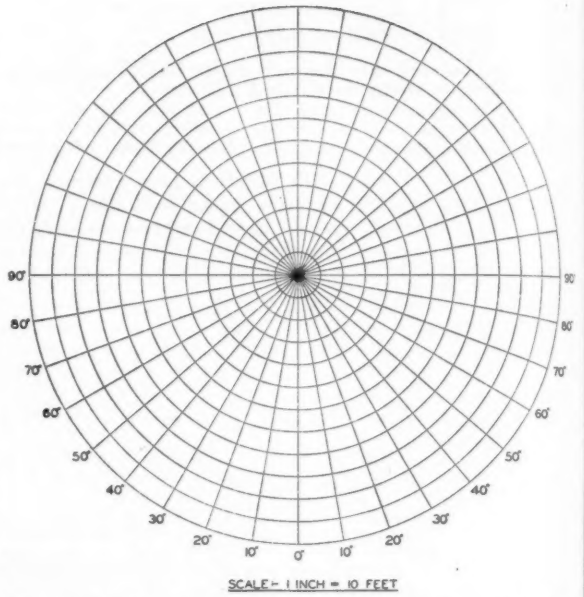



FIGURE 2.—*Web for development of Isolux curve for single unit.*

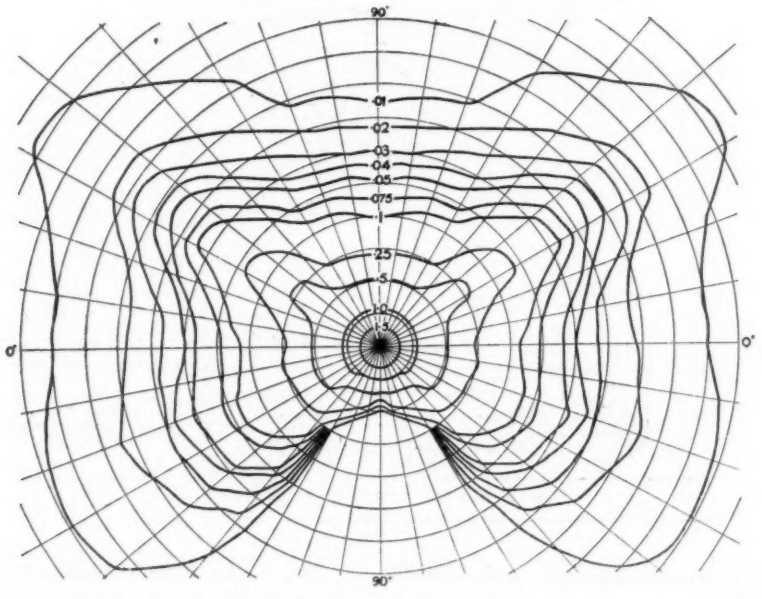



FIGURE 3.—*Isolux for single unit developed on web shown in Figure 2.*

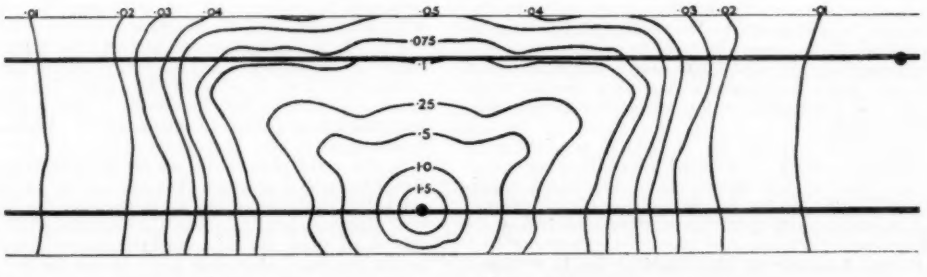



FIGURE 4.—*Road plan with Isolux for single unit superimposed.*

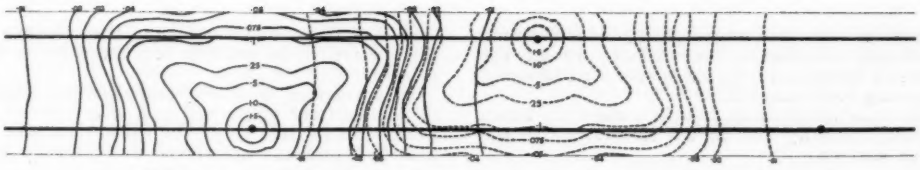


FIGURE 5.—*Road plan with Isolux for each unit superimposed.*

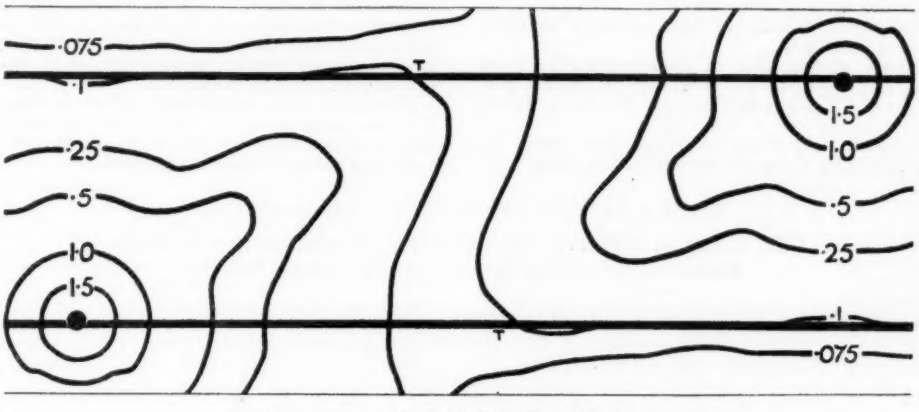



FIGURE 6.—*Completed Isolux diagram.*

isolux lines for each of the sources have been traced on to the road plan.

Fig. 6 is the completed isolux diagram, and this is obtained from fig. 5 by joining the points of equal illumination resulting from the combined effect of the two lamps.

The illumination at the test-point is indicated, and the diagram gives the information required as to the distribution of light over the carriageway and footway.

The preparation of an isolux diagram is somewhat laborious. Another method is to select a number of points on the road surfaces at positions agreed upon between the contracting parties, and calculate the illumination at these points.

*Average Illumination.*

In regard to Requirement (*b*), it is desirable to make a calculation of the average illumination on the road surfaces as it is apparent from a study of the schemes in Appendix (3) that although in two given installations the same illumination can be secured on the test point, the average illumination may yet be widely different. As a rule schemes which make use of directional reflectors will give a lower average illumination than those schemes which are not dependent upon this method to secure the necessary illumination at the test point.

If the method of calculating the average illumination described in the British Standard Specification for Street Lighting, 1931, is adopted a ready comparison can be made between competitive schemes.

## DIRECTIONAL REFLECTORS FOR GAS UNITS.

*Classification.*

There are a great many directional reflectors available, but it is a simple matter to classify them into three sections.

*Class* 1. In this class the directing surface is fitted underneath the mantles in order to re-direct

*Summary of Lighting Scheme. 40 Ft. Road, No Overhang. (Appendix* (3).)

| British Standard Class. | Rated Mean Test-Point Illumination. | Mounting Height. (Ft.) | Spacing. (Ft.) | Spacing/ Height Ratio. | Reference Number of Unit. | Normal Gas Consumption (500 C.V. Gas). (C.Ft. per Hour.) | Gas Used per Hour per 1000 Sq. Ft. of Roadway Illuminated. | Average Illumination. | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Carriageway. | Footway. |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| H. | 0·01 | 13 | 143 | 11 | 2 | 7·0 | 1·2 | 0·084 | 0·094 |
| H. | 0·01 | 13 | 136 | 10½ | 1 | 3·5 | 0·7 | | |
| H. | 0·01 | 13 | 143 | 11 | 5 | 5·0 | 0·9 | | |
| H. | 0·01 | 13 | 143 | 11 | 7 | 5·0 | 0·9 | 0·040 | 0·051 |
| H. | 0·01 | 15 | 150 | 10 | 2 | 7·0 | 1·1 | | |
| H. | 0·01 | 15 | 165 | 11 | 3 | 7·0 | 1·1 | | |
| H. | 0·01 | 15 | 150 | 10 | 5 | 5·0 | 0·8 | | |
| G. | 0·02 | 13 | 117 | 9 | 9 | 10·0 | 2·1 | | |
| G. | 0·02 | 13 | 110½ | 8½ | 5 | 5·0 | 1·1 | | |
| G. | 0·02 | 13 | 110½ | 8½ | 3 | 7·0 | 1·6 | | |
| G. | 0·02 | 15 | 127 | 8½ | 9 | 10·0 | 2·0 | 0·108 | 0·123 |
| G. | 0·02 | 15 | 165 | 11 | 11 | 10·0 | 1·6 | 0·083 | 0·082 |
| F. | 0·05 | 13 | 84½ | 6½ | 13 | 12·5 | 2·7 | | |
| F. | 0·05 | 13 | 117 | 9 | 16 | 12·5 | 2·7 | | |
| F. | 0·05 | 15 | 90 | 6 | 13 | 12·5 | 3·5 | | |
| F. | 0·05 | 15 | 127 | 8½ | 16 | 12·5 | 2·5 | | |
| F. | 0·05 | 18 | 99 | 5½ | 13 | 12·5 | 3·2 | | |
| F. | 0·05 | 18 | 130 | 7½ | 16 | 12·5 | 2·4 | | |
| E. | 0·10 | 18 | 99 | 5½ | 21 | 25·0 | 6·3 | 0·35 | 0·37 |
| E. | 0·10 | 18 | 126 | 7 | 19 | 17·5 | 3·5 | | |
| E. | 0·10 | 18 | 153 | 8½ | 24 | 30·0 | 4·9 | 0·503 | 0·53 |
| E. | 0·10 | 21 | 105 | 5 | 21 | 25·0 | 6·0 | | |
| E. | 0·10 | 21 | 137½ | 6½ | 19 | 17·5 | 3·2 | | |
| E. | 0·10 | 21 | 168 | 8 | 24 | 30·0 | 4·5 | | |
| D. | 0·20 | 21 | 105 | 5 | 19 | 17·5 | 4·2 | | |
| D. | 0·20 | 21 | 115½ | 5½ | 23 | 30·0 | 6·5 | | |
| D. | 0·20 | 21 | 126 | 6 | 24 | 30·0 | 6·0 | | |
| D. | 0·20 | 24 | 108 | 4½ | 19 | 17·5 | 4·0 | | |
| D. | 0·20 | 24 | 132 | 5½ | 24 | 30·0 | 5·7 | | |
| D. | 0·20 | 24 | 156 | 6½ | 25 | 60·0 | 9·6 | 0·78 | 0·83 |
| C. | 0·50 | 21 | 95 | 4½ | 25 | 60·0 | 15·8 | | |
| C. | 0·50 | 24 | 108 | 4½ | 25 | 60·0 | 14·0 | 1·13 | 1·20 |

some of the downward flux, which would normally illuminate the surface around the base of the column, into a zone suited to street lighting requirements.

*Class* 2. Reflectors designed to re-direct the flux, which would normally fall on the houses, on to the road surface.

*Class* 3. Reflectors designed to re-direct on to the road surface the flux which would normally pass into the upper hemisphere.

Class 3 is the type which, in the author's opinion, possesses special advantages.

There is no very strong line of demarcation between Classes 2 and 3, as certain of the reflectors of Class 2 perform the function of Class 3 reflectors to a greater or lesser extent.

It should be noted that many excellent directional reflectors exist other than those for which curves have been given, a notable case being the mirror reflector used by the South Metropolitan Gas Company in many of the prominent streets in South London. This is an extremely useful method of re-directing on to the road surface light which would normally fall upon the houses. An additional advantage is that the light is directed across rather than along the traffic stream.

*New Features in Directional Reflectors.*

Up to the present the great majority of directional reflectors used have been made of Staybrite steel, or chromium plated copper, but recently mirror glass with an electrically deposited lead coating at the back of the mirror, in order to preserve the mirror from damage, has become available, and there is reason to believe that this coating will effectively prevent weather conditions from destroying the reflecting surface.

*Directional Reflectors for High-Pressure Units.*

Directional reflectors have also been applied in a new way to high-pressure units. Reference to the polar curve of unit No. 23, Appendix (1), which is typical, will show that there is a large flux of light near and above the horizontal. This is usual in high-pressure lamps in the absence of directional reflectors. The provision of directional reflectors which cut off a large proportion of this flux above and down to approximately 5° below the horizontal and re-direct it into a more suitable zone should have the effect not only of increasing the illumination of the test point, but also of improving visibility in the street in so far as the flux in a direction which normally gives rise to glare has been partially eliminated.

Use of Isocandle Diagrams.

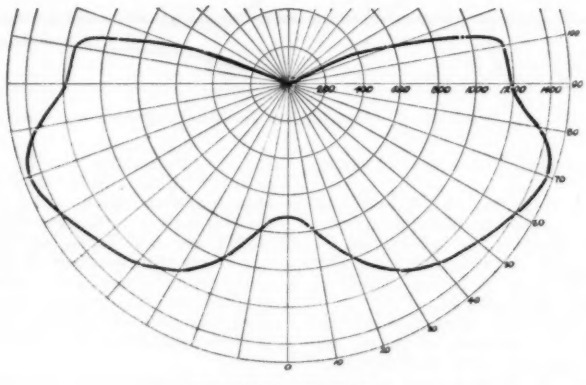
In regard to the schemes given in Appendix (3), in some cases the distribution curves are not directly applicable to a road of these dimensions, and the reflector must be modified before it is suitable for the scheme to which it is referred.

It is assumed that the comparatively slight adjustments in the vertical angle will not affect the character of the beam; but in the case of the azimuth angles this cannot be assumed, and an experiment was made in which the angle between the two halves of the reflector was changed. The maximum candle power was measured in a series of positions, and the results plotted on the same diagram. The smooth curve obtained by joining maximum to maximum gave the required variation of beam intensity with azimuth angle. These results have been used in many of the schemes in Appendix (3).

When ordering directional reflectors for a given scheme it is necessary to specify the angles at which the maximum candle power is required or to quote the spacing height ratio and dimensions of the street.

No. 23 Unit.—Distribution Curve (*Appendix* (1)).

*1 No. 3 Mantle, High Pressure, fitted in Suspension Lamp with White Enamelled Top Reflector and no Directional Reflector.*



PHOTOMETRIC DATA.

| No. of Unit. | Gas Rate in C.Ft. per Hour, 500 B.Th.U. Gas. | Candle Power, M.L.H. C.P. | Flux in Lumens. | | Efficiency. | | $R = \frac{\text{Lumens (Lower Hemisphere)}}{\text{Total Lumens}}$ |
|---|---|---|---|---|---|---|---|
| | | | Lower Hemisphere. | Total. | M.L.H Candles. Per C.Ft. Per Hour. | Total Lumens, Per C.Ft. Per Hour. | |
| 23 | 29·3 | 1304 | 8190 | 10,610 | 44·5 | 362 | 0·77 |

*Projecting Kerb Lines on Isocandle Diagrams Plotted on Sinusoidal Projection.*

The author has found that considerable difficulty is often experienced in visualizing the projection of the kerb line (see fig. 4, page 25, British Standard Specification for Street

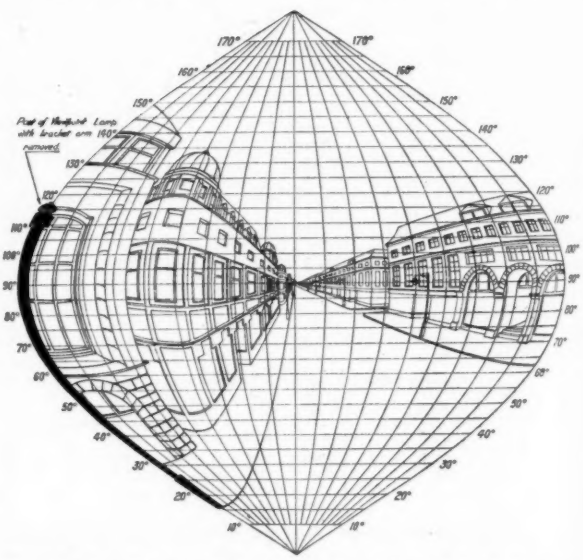


Figure 7.—*Diagram illustrating position of kerb lines on sinusoidal projection.*

Lighting, 1931), and he is indebted to his colleague, Mr. L. T. Minchin, B.Sc., for the conception of the drawing given in fig. 7, which it is hoped may be useful to those who also have experienced this difficulty.

## DISCUSSION.

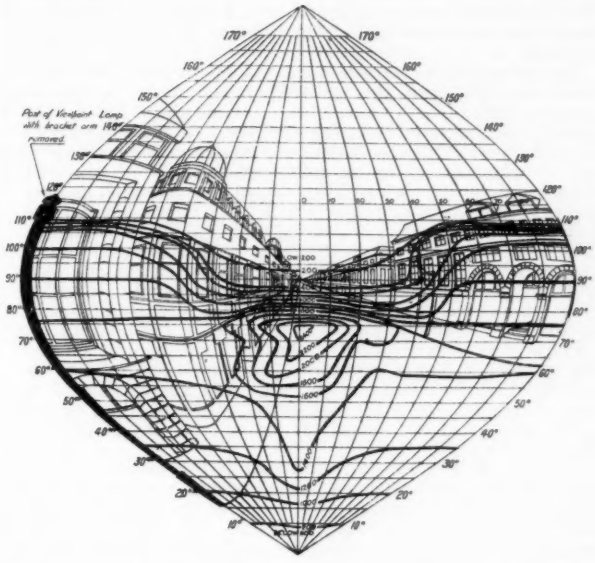
Lieut.-Commander HAYDN T. HARRISON remarked that fig. 7 in Mr. Smith's paper was an extremely clever diagram which would make clear to a large number of people what the onion diagram really meant. He did not altogether agree with the onion method as being the best. For men used to plans, he thought the isolux method, which Mr. Smith had been good enough to give them in several examples, was better. If they had a street surface—and he would take it for granted that they were only concerned with the street surface—they divided it up into areas of, say, 100 sq. ft. If they had one of these isolux diagrams and it was divided into areas by drawing vertical and horizontal lines at a distance of 20 ft. they got a certain number of squares in which they might be able to say that the illumination in various places would be 1/100th part. Of course, there were two definite things which they could work to. One was the maximum, the other the minimum; and they had two infinities at either end of the street. They must never forget that; and it was beautifully shown in fig. 7 in Mr. Smith's paper. In the case of fig. 7 they had an actual area in which they could mark definite points at which they wanted to know what the illumination was likely to be.

### WHAT IS "CANDLE-POWER?"

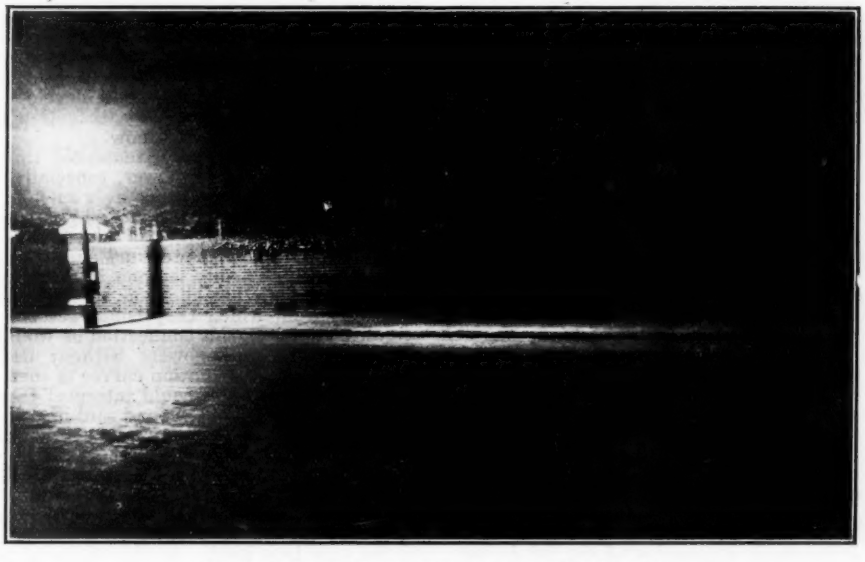
They had to face the rather awkward question that people would talk about candle-power. He thought they would never get away from it; and yet nobody had decided how to describe the candle-power of street lighting. Was it the candle-power which they had shining on them when they stood in a certain position, or was it the candle-power which was the average of all candle-power shining on them when they were standing in a certain number of definite positions, or was it as some people seemed to think, the mean spherical candle-power. The mean spherical candle-power, as a matter of fact, did not interest him in the least. He did not care a bit what happened above the lighting level, because nobody had contracted to light the upper stories of buildings, or aeroplanes which might pass over. That cut them down to the lower hemispherical; and therefore he would like to have this very debatable question decided. Glare had been talked about by everybody, but it had not been seriously dealt with by anybody except those people who maintained that they should definitely cut the light off by any means possible in order to prevent the pedestrian or driver from seeing the light source. He maintained—and he knew from actual practice over a long period—that if they attempted to do that nobody would get any light at all, and for a very good reason. One of the chief objects of street lighting was to light the faces of the people using the streets. That was essential if the police were to obtain any advantage from street lighting. What was the use of any street lighting which prevented the police from obtaining some indication of what a person was like? There must be at a height of 5 ft. at least enough illumination to enable the police to do their work and, therefore, it was no use making measurements of this sort on the ground level from that point of view.

### AN INTERESTING EFFECT.

Mr. L. T. MINCHIN (Gas Light and Coke Company) said he would like to draw their attention by means of the accompanying diagram to the interesting effect of superimposing an isocandle diagram and a drawing of the street



on the same projection. The curve used in this case referred to a 1500 c.p. high-pressure lamp with the new type of directional reflector, and it would be readily seen that the shadow cast by this reflector fell almost wholly upon the sky, and the additional c.p. obtained at 70-75° was therefore due to redirected light which would otherwise have been wholly wasted.



AN INFRINGEMENT OF THE B.S.I. SPECIFICATION.

If some impression of the distribution of light on the buildings to be obtained with a new lighting installation were desired, it would be a simple matter to draw in the b/h lines for the top and bottom of the face of the buildings without necessarily indulging in such a detailed drawing as was here shown.

Mr. Smith had considered the design of installation solely from the point of view of test-point illumination, and while, of course, this was the first point to be considered, there were two other clauses the neglect of which had brought some criticism on the specification.

In Clause 19 it was stated that no part of the ground

should have a lower illumination than the test point, and there was no guarantee that in installations designed by the author's method this would be so, although it would, of course, be apparent from the isolux diagram if this was constructed. The seriousness of this consideration was shown by the accompanying photograph taken in a London suburban street where a type of lighting unit which had achieved wide popularity was employed. The candle-power in the direction of the test point was eight times that of the bare source, but as was obvious from the illustration, the beam was much too narrow, and the installation was an undoubted infringement of the specification. The illuminant was not, in this case, gas; but it was possible that a somewhat similar condition might arise with gas lighting.

The other clause to which he wished to refer was that which required that the installation should be as free as possible from objectionable glare. While there was at the present no generally recognized method of assessing glare, the relative glaring properties of an installation could be very simply assessed by an examination of the distribution curve of the unit. It had been shown that as much as two-thirds of the glare might be due to the lamps beyond the first one, and this was, of course, due to light reaching the eyes, which had no affect whatever on the illumination of the road. Logically, this light should be cut off at, say, 85°; but æsthetic considerations did not usually allow of this. It was clear, however, that if light was to be allowed at this angle it should not be unnecessarily augmented.

There was a very popular electric lighting unit on the market which had a horizontal candle-power (along the kerb line) of 250 when one 60 watt lamp was fitted, and it was unfortunate that the somewhat vague wording of the specification did not positively debar the use of such a fitting.

It would in general be found that if the average of the luminous intensity at 90°, 85°, and 80° in a plane parallel to the kerb did not exceed, say, twice or 2½ times the mean hemispherical candle-power, the glare effect would not be serious; and he suggested that some such clause might temporarily be embodied in the specification.

### Purely a Question of Total Cost.

Mr. E. Stroud (Holophane Ltd.) observed that the British Standard Specification was really designed—he happened to be a member of the Committee, and they had been working at it for some years—to give a lead. Previous to the specification nobody knew what was required, and the specification had really given a lead. The enormous interest which the specification had aroused was manifest by the many papers which had been written around it. The central object was to get street lighting at a minimum cost, and manufacturers had been endeavouring to meet the requirements. Lighting units had been produced to give various types of distribution, &c., and he was convinced that when the public lighting authorities were able to say exactly what they required, the manufacturers would be able to produce it and give them the best results in an engineering way, which meant in the most economical manner. He did not want to bring in the question of gas *versus* electricity, and it is really to allay feelings on the matter that he mentioned it. It is not a question of gas or electricity but a question of illumination. Whether one used gas or electricity, in his opinion, was a purely local consideration. For instance, yesterday one speaker said that the cost of street lighting by gas in his town was 50 p.ct. cheaper than lighting by electricity, but he did not tell them the price for gas. On the other hand, had electricity been one-third cheaper than gas, it was possible that electricity would have been used. If the two forms of illumination are of equal cost, then it is necessary to consider the other factors of maintenance, &c. All this was common-sense, and it was no use in a general way saying that gas was dearer than electricity or electricity was dearer than gas. It is purely a question of the total cost in any particular locality.

Mr. C. H. Woodward (Lighting Superintendent, Bournemouth) said that to try to carry out an illumination scheme now without the use of such charts as those given by Mr. Smith would be like the mariner who totally ignored orthographic projections and the iso-projections which they had had for many years.

### Simplifying a Complicated Problem.

Mr. C. C. Paterson (Chairman of the British Standards Institution Street Lighting Committee) suggested that many people had the impression that diagrams like these were making things very complicated; but the diagrams seemed to him to be simplifying a complicated question, rather than making it more complicated. He said that particularly of fig. 7 in Mr. Smith's paper. It was indeed gratifying to those of the Street Lighting Committee who had worked hard for about ten years to see that, as the street lighting specification was gradually evolved to suit practical conditions, it was being used more and more and appreciated more and more. Those who were evolving the street lighting specification were doing so with the full consciousness that it was not perfect at the present time; and there was little doubt that in ten years' time the specification would be a different and better one than the present.

Dr. J. S. G. Thomas (South Metropolitan Gas Company) said he would like those who really understood these iso-candle diagrams to put up their hands. (Loud laughter; no hands were put up.) The trouble in connection with these iso-candle diagrams was that it was an attempt to apply a method of spherical projection to plane surfaces. At the same time such an attempt was bound to fail. They found references to $2\pi$; but what had that to do with the matter? It is obvious that the thing had gone off the lines. It has been stated that the paper pointed the road, but he thought it pointed more to the lunatic asylum than anywhere else (loud laughter). The point about the iso-candle diagram was that it was an attempt to determine the average illumination of a street; but it was extremely difficult to determine the average illumination of a road, and he said it was quite unnecessary. An average must be significant, and it must have some meaning; but it was a very difficult thing to determine. He remembered a Government publication some years ago referring to a certain insect which bit people fatally, and the statement was made that the average of the people so fatally bitten was 45 years. But when one looked at the actual figures, one found that the ages varied between 5 years and 85 years (loud laughter). That was the sort of thing one got when one talked of averages.

### Horizontal or Vertical Illumination.

Then, again, it would be seen that the paper spoke of horizontal illumination; but why horizontal? The normal posture of a human being was upright, so why determine the illumination on a horizontal basis. The point of having illumination was to be able to pick out people in the streets and roadways; but with horizontal illumination they would only be able to pick out the people when they were lying in the roadways or on the pavements. He knew there was a good deal of fast motor traffic about nowadays, but surely they were not to assume that everybody in the streets had been knocked down, and that therefore they must measure illumination on a horizontal basis? (renewed laughter). The only thing he found satisfactory about this matter was that there were people in the Gas Industry with the intellect to do the work that had been done. The Gas Industry had for a long time developed an inferiority complex; and it was a great satisfaction to find this work being done in the Industry now.

Mr. Smith, in his reply, remarked that he could say a good deal about candle-power, especially in makers' catalogues; but he did not think he would do it then. If Mr. Harrison looked at the Appendices in the paper he would see that he (the author) had given both the lower mean hemispherical candle-power and the total lumens; and Mr. Harrison would readily see how to get the spherical candle-power from that. In addition, he had given the iso-candle diagrams from which they could get the candle-power in any direction. In this connection he would urge all makers not to state candle-powers without definition. If they would put their distribution curves in their catalogues, then illuminating engineers could interpret them. With regard to the isolux diagrams, he had said in the paper that it was somewhat laborious to prepare such diagrams; at the same time, he suggested that the labour was worth while, because in many cases street lighting installations would remain unchanged perhaps for 10 or 15 years, and it was worth spending the few hours necessary in order to make sure that they were putting up an installation which was of the very best kind. At this stage in their development they could not afford any haphazard methods. It was the wrong way to make measurements in the streets and then to make their alterations afterwards.

He would like to thank Mr. Stroud for his impartial remarks. It was refreshing to remember that they were considering not electricity or gas, but lighting; and if the municipal engineer would tell the lighting authority what he really wanted, then a competent illuminating engineer could supply it for him.

He very much appreciated what Dr. Thomas had said; and seriously he thought he was advocating vertical illumination. But a great many of them had given considerable thought as to whether vertical illumination ought to be specified. When they came to think about it there were very many difficulties to be overcome. However, when they saw their case more clearly, perhaps they would be able to do something to meet Dr. Thomas' suggestions.

# Concentrated Gas Liquor—Its Manufacture by Modern Methods and Its Utilization*

By R. J. PHILP, M.Inst.Gas E., Engineer and Manager to the North Berwick Corporation Gas Department.

In the Sixty-Eighth Annual Report of the Chief Alkali Inspector for the year 1931 there is, on p. 13, one significant paragraph which constitutes a suitable preface to this contribution. The paragraph in question reads:

> No method for the destruction of raw liquor hitherto evolved can be described as satisfactory. Not only are such methods wasteful, but they nearly all lead to increased atmospheric pollution. Indeed, it is questionable whether means of destruction will prove substantially less costly than recovery. There are already signs of a slump in spent oxide, due to decreasing salt production and consequent less sulphuric acid production. Considering this together with all the possibilities of damage to gas-works plant and discomfort to employees and neighbouring residents by the employment of destructive methods, the apparent advantage derived by shutting down sulphate processes is likely to prove disappointing when all costs are properly estimated, especially as there is now a tendency for prices to rise. In several instances this has already been the case. Destructive methods have been adopted, but owing to one or other of the reasons enumerated above, they have been abandoned and reversion made to sulphate or concentrated liquor manufacture.

For the past few years I have been concerned about the pecuniary loss incurred in the disposal of gas liquor, and decided, after carefully considering the economics of my own case, to install the Thorncliffe-Baldurie process for the manufacture of concentrated gas liquor, as this process offered a means by which the loss could be materially reduced.

Hitherto gas liquor had been disposed of in my own case on the following basis: 2s. 6d. per ton was paid for gas liquor of 5° Tw. (10 oz. strength), in respect of which my Corporation was incurred in carriage charges of 5s. 10d. per ton.

By the installation of concentrated gas liquor plant, I found that my Corporation's pecuniary position in respect of bye-product ammonia would be approximately as follows:

[Production of gas liquor at North Berwick Works is 570 tons per annum.]

| | £ | s. | d. |
|---|---|---|---|
| Payment in respect of carriage—570 tons at 5s. 10d. per ton = | 166 | 5 | 0 |
| Receipt for gas liquor—570 tons at 2s. 6d. = | 71 | 5 | 0 |
| Loss on gas liquor for year was | £95 | 0 | 0 |

Last autumn we received notice that no payment was to be made for gas liquor; our loss in future was therefore to be £166 5s. sterling per annum. Under concentrated gas liquor conditions it was suggested that the expenses incurred would be:

570 tons
7·6 tons of gas liquor per ton of concentrated gas liquor
= 75 tons of concentrated gas liquor.

| | £ | s. | d. |
|---|---|---|---|
| Railway carriage on 75 tons of concentrated gas liquor at 5s. 10d. = | 21 | 17 | 6 |
| Cost of manufacturing concentrated gas liquor, say, 10s. per ton = | 37 | 10 | 0 |
| | £59 | 7 | 6 |

making a total loss of £59 7s. 6d. for the year.

Thus, assuming that my Corporation were to receive no payment for concentrated gas liquor, it was evident that by the installation of a concentrated gas liquor plant, it would be possible to reduce the loss from £166 5s. to £59 7s. 6d. per year. Allowing for interest on the cost and depreciation of the plant, it would still show a considerable saving.

### JUSTIFICATION FOR THE PLANT.

As, however, there was a definite prospect of realizing a satisfactory price for concentrated gas liquor, it was obvious that I was justified in proceeding with the installation of the plant in question, as Messrs. Henry Balfour & Co., Ltd., of Leven—the contractors—were willing to supply their plant and process on the basis of "no cure, no pay."

The plant in question, which possesses special features, was erected towards the end of last year, and the anticipations held out to me by the Contractors have been abundantly realized. This, of course, would have been impossible if I had arranged to install the old type of concentrated gas liquor plant. Messrs. Henry Balfour & Co., Ltd., pointed out how important it was that labour should be dispensed with if concentrated gas liquor were to be economically produced.

The plant that I have installed has been carefully designed, and combines several important features of which the following are the most notable:

(1) Not more than 22 p.ct. of steam is required to dissociate the ammonia and other constituents from gas liquor, containing 2·2 p.ct. of total ammonia.
(2) Dephlegmation takes place within the still itself.
(3) No attempt is made to recover the fixed ammonia, as under present market conditions this is not an economic proposition.
(4) The preheaters and coolers are of the concentric tube type, specially designed to ensure turbulent flow. In connection with the coolers, only a minimum quantity of water is required.
(5) The plant is equipped with automatic controls, and the "Arca" type of regulator equipment, which has been adopted, functions in a satisfactory manner.

It will, perhaps, be desirable to enlarge on the latter aspects, and then to furnish a description of the plant installed and the method of operation.

1. Steam and labour are the principal items in the cost of manufacture of concentrated gas liquor. Any plant, therefore, which can dispense with labour, and at the same time ensure maximum economy in the use of steam, as is possible with the plant that I have installed, must possess undoubted attraction.

On the aspect of dispensing with labour I hope to make one or two pertinent comments a little later.

As regards the consumption of steam in the production of concentrated gas liquor, this matter has been dealt with at some length by Mr. P. Parrish, F.I.C., M.I.Chem.E., of London, in his book on "The Design and Working of Ammonia Stills." Mr. Parrish has set out explicitly on p. 191 of his book the thermal aspect, from a theoretical point of view, as applying to the manufacture of concentrated gas liquor. From the details furnished by him, I have prepared the following table, which represents the conditions obtaining in connection with my own plant at North Berwick.

*Table Showing the Theoretical Consumption of Steam in the Manufacture of Concentrated Gas Liquor at North Berwick.*

[Expressed in terms of lb. of steam per lb. of ammonia.]

| — | B.Th.U. | Steam. Lb. | P.Ct. |
|---|---|---|---|
| (*a*) One lb. of ammonia requires for dissociation | 2044 | 2·12 | 20·2 |
| (*b*) To heat 40 lb. of gas liquor from 172° Fahr. to 214° Fahr. | 1680 | 1·74 | 16·7 |
| (*c*) Heat radiated per minute | 620 | 0·70 | 6·7 |
| (*d*) Lb. of water in concentrated gas liquor, averaging, say, 17 p.ct. $NH_3$ | .. | 5·90 | 56·4 |
| | | 10·46 | 100·0 |

Actual determinations have been made, and it is known that slightly less than 22 p.ct. of steam is required for the production of concentrated gas liquor (17 p.ct. $NH_3$) from gas liquor of 10 oz. strength (2·17 p.ct. $NH_3$). On the basis of the theoretical figures furnished in the table above the steam consumption should be:

P.Ct.
2·17 $NH_3$ (total) *less* 10 p.ct. fixed ammonia (not removed)
= 0·217

1·953 *less* ammonia in effluent liquor
= 0·020

1·933

= say, 1·933 lb. × 10·46 lb. = 20·22 lb. of steam.

Thus, it is seen that the actual steam required for the dissociation of the ammonia in the production of concen-

*Paper read before the North British Association of Gas Managers, Sept. 8, 1932.

trated gas liquor by the plant that I have installed approaches very nearly the quantity which theoretical considerations suggest is necessary.

Such excellent results can only be obtained with a plant which purposely aims at conservation of the available heat, which provides a still which is efficiently insulated, where the bubbling trays and seals admit of a multiplicity of fine bubbles, where the ascending steam-ammonia stream effectively encounters the descending liquor, where refluxing to ensure the required concentration of ammonia in the final concentrated gas liquor is controlled by the temperature of the in-coming liquor, where the in-coming liquor is preheated by the out-going steam-ammonia stream, and where dephlegmation is effected within the still proper.

All the foregoing conditions are incorporated in the still as provided by the Thorncliffe-Baldurie process.

2. I have already remarked upon one advantage of dephlegmation taking place within the still, from a heat-conserving point of view. Another advantage lies in the fact that it is cheaper to make the top portion of the still a dephlegmator than it is to provide a separate vessel for this purpose. Moreover, there is less possibility of the reflux liquor crystallizing, due to the presence of ammonium bi-carbonate.

3. It is generally agreed, save under exceptional circumstances, that having regard to present-day market conditions for bye-product ammonia, it is unprofitable to eliminate the fixed ammonia. A few calculations will demonstrate the cogency of what I urge in this respect:

One ton of ammonia requires:

$$\frac{56}{34} = 1{\cdot}59 \text{ tons of calcium oxide (CaO),}$$

or say

$$\frac{1{\cdot}59 \text{ tons CaO}}{92 \text{ p.ct. CaO in commercial lime}} = 1{\cdot}73 \text{ tons of commercial lime, which, at 32s. 6d. per ton, represents}$$

£2 16s. 3d. for each ton of ammonia released from the fixed ammonia of gas liquor.

But the use of lime involves water, steam, and labour in the manufacture of cream of lime, besides which lime sludge is produced, and the costs of settlement and removal of the latter are by no means inconsiderable.

Certainly not less than £5 per ton of ammonia is required for the recovery of fixed ammonia from gas liquor. As no one is making even 50 p.ct. of the foregoing amount per ton of ammonia from ammonium products to-day, it is obvious that to discard the fixed ammonia is not only a prudent course, but a commercial proposition.

4. No one who has studied the design of plant adopted by the ammonia-soda industry can fail to recognize the value of the concentric tube type of preheater and cooler. In far too many cases, in connection with sulphate of ammonia plants and apparatus for the production of various qualities of aqueous ammonia, single pass preheaters and coolers have been adopted, without due regard to the critical velocity—*i.e.*, the velocity at which stream-line ceases and turbulent motion starts. As a consequence of unsatisfactory design, large quantities of water are unnecessarily used, and unwieldy apparatus for preheating or cooling have been employed.

## Automatic Control.

5. One of the tendencies to-day is to resort to automatic control. This does not apply to one activity alone, but can be observed in various fields. The London, Midland, and Scottish Railway, in conjunction with one of their widening schemes, have introduced speed signals, which tell the driver of a train whether the line is clear ahead, and also instructs him as to the speed at which he is proceeding. The signals consist of coloured lights, which are so powerful that their beam is visible a thousand yards away in bright sunlight, and for a considerable distance in thick fog. Each signal has three different aspects which indicate the road the train is to take, and whether it is to travel at high, medium, or low speed. By means of track circuiting each train automatically protects itself by keeping the signals behind it at "danger" until it has cleared the next signal ahead.

If automatic control can be applied successfully to rapidly moving transport, it would hardly seem difficult to apply automatic control to stationary plant, where conditions of operation are inter-dependent, and synchronization is essential.

The Thorncliffe-Baldurie automatic control is protected. It provides for the maintenance of a pre-determined still-head temperature, which varies with the concentration of ammonia in the gas liquor, the supply of steam to the still, and the concentration of ammonia in the concentrated gas liquor.

In order to ensure a uniform still-head temperature, the rate of feed of gas liquor to be concentrated, and the supply of steam, are maintained substantially constant by suitable delicate controls. Steps are also taken to legislate for an increase of pressure beyond a certain pre-determined one. If such pre-determined pressure is exceeded (which can only be due to the crystallization of ammonium bi-carbonate in the condenser tubes), then the liquor feed is automatically checked. Thus the temperature of the gases to the condenser is increased, the ammonium bi-carbonate is dissociated in consequence, and as soon as the excess pressure is removed the gas liquor feed is restored to normal.

This explains in simple and non-technical language the underlying principles of the automatic control, and I can only say that such automatic control has functioned to my complete satisfaction in connection with the plant at my works, and that there is no need for any labour in the manufacture of concentrated gas liquor by the Thorncliffe-Baldurie process.

## The Plant at North Berwick.

At this juncture it will be apposite for me to explain the plant as installed at my works, and to say a few words as to the method of working, and what my personal experience has been.

The plant consists of a patent still of 1 ft. 6 in. internal diam. with 11 compartments 9 in. deep, fitted with trays, overflow pipes, and access doors for cleaning purposes, complete with bottom and top sections. Preheater and condenser of the double tube construction having internal tubes 1¼ in. bore by 6 ft. 7 in. long and external tube 3 in. bore by 6 ft. long fixed to header box, each section being connected by means of a return bend. Inlets and outlets are fixed as shown for each unit. There is one overhead cast iron storage tank, 12 ft. by 8 ft. by 4 ft. deep, formed of cast-iron plates 4 ft. sq. by ⅜ in. metal. This tank is supported on rolled steel joist framing, as shown on drawing. This tank is used for the storage of concentrated gas liquor, the capacity being 2200 gallons, or fully 11 tons. On top of the concentrated liquor tank there is fitted a small scrubber to purify the gas discharged from tank when filling with liquor. In addition another tank 6 ft. by 4 ft. by 4 ft., with a capacity of 1100 gallons, is used for storage of weak liquor as a feed supply tank.

The weak liquor is pumped from the feed supply tank to preheaters and thence to the still—the gases from the still being used to preheat the liquor—and finally condensed and gravitates to the concentrated liquor storage tank. A water supply is fixed to the condenser, but in actual practice very little water is used. The pump is steam driven, and is of the rotary type, connected to the steam supply which passes through the building where the plant is erected.

On top of the pipe from the still to the preheater is fitted the "Arca" temperature regulator and pressure regulator which control the valves operating the supply of the liquor to the pump. Thus the entire plant is automatic and needs no labour. An "Arca" pressure regulator is fitted to the steam supply with automatic control for the steaming of the still.

In the event of a stoppage the liquor supply is by-passed at the pump by means of a spring-loaded valve. The storage tank is kept high enough to fill railway wagons direct from the tank. Platforms of wood, with access stair and handrails are fitted round the apparatus for viewing and adjusting the various elements. The working is automatic.

We have storage for gas liquor for roughly fourteen days, or 30 tons, and we wait until the tank is almost full before starting up the plant. The man who starts the process is a labourer employed on the usual work done by a labourer in a gas-works.

## Working of the Plant.

I shall now describe briefly the working of the plant. First, the water control valve is turned on, and then the steam valve to the still is slowly opened. It takes about one hour to heat up the still and the condensers to the required heat. Next the pump is put into operation, and a very small feed of water is turned on to the condensers. The liquor gradually increases in strength until it is 26° Tw., when the cock leading to the concentrated gas liquor tank is opened. During this period the pressure of steam into the still is gradually increased from 3 to 5 lbs. From the time the steam is turned on to the still until 26° Tw. liquor is produced the weak liquor is returned to the storage tank containing the feed supply liquor. A test pipe is placed in a convenient position and tests are made occasionally to see the actual strength of liquor being produced. It takes about 1 to 1½ hours to get the strength from, say, 5° Tw. to 28° Tw.

We usually work the strength up to 28° Tw. after which the plant is left to look after itself. The man makes visits occasionally to see that it is working satisfactorily and he takes a test periodically. He also requires to oil the pump once in three hours, but this only occupies a few minutes.

The labourer leaves at 5 p.m., after which the stoker looks at the plant now and again. You will observe from my remarks that no additional labour has been introduced into the works for the working of the plant.

The storage tank holds a 12-hours' supply and is filled by gravitation from the overhead tank at the other end of the works. The capacity of the plant is ten tons per 24 hours, so that the storage tank requires to be filled up twice per day.

To close the plant down, the pump is shut off, and the steam continues to go into the still; the strength of the liquor is gradually reduced until it is 6° Tw., when the valve admitting steam to the still is shut. The water control valve is then closed, the supply of water to the condensers shut off, and the water drained out of the condensers. This work takes about one hour.

A reduction of temperature results in an increased liquor flow, and increased concentration of ammonia in the concentrated gas liquor. An increase of temperature results in a reduction of the quantity of liquor distilled, and also a reduction of the content of ammonia in the concentrated gas liquor. With automatic control, constancy of conditions can be ensured. The temperature at which we work is about 86° C. The North Berwick quality of concentrated gas liquor begins to crystallize at 29° to 30° Tw., at normal temperature.

Since Dec. 23, 1931, when we sent the first tank of crude liquor to the distillers, we have despatched three tanks of concentrated gas liquor—a total of about 32 tons. During the same period for the previous year we sent 323 tons, so that we are making one ton of concentrated gas liquor from 10 tons of crude liquor. The contents of the first tank were 12 p.ct. $NH_3$; the second, 16·5 p.ct.; and the third, which is being consigned as I write this paper, will be 16 to 17 p.ct. $NH_3$.

This compares with the 7·6 tons of gas liquor per ton of concentrated gas liquor, which was the figure given at the commencement of the paper, and represented the figure on which we were told to base when considering the erection of the plant.

The cost of manufacturing concentrated gas liquor was given originally as 10s. per ton, and my calculations show that this figure is substantially correct. It is rather difficult for me to say more, as the plant has been working intermittently. I have had a considerable number of visitors to see the plant, and I am anxious that they should see it working, if at all possible. What allowance should be made in respect of repairs and maintenance it is too early yet to say.

As mentioned at the beginning of this paper, we had hoped to realize a price for concentrated gas liquor, and I am pleased to say that we are at present in receipt of the sum of 1s. 3d. per unit of ammonia. The results to date enable me to submit the following figures as indicative of the financial position:

| | £ | s. | d. |
|---|---|---|---|
| 57 tons concentrated gas liquor at £1 a ton = | 57 | 0 | 0 |
| Cost of manufacture, say, 10s. £28 10 0 | | | |
| Railway carriage, say, 57 tons at 8s. a ton 22 16 0 | | | |
| | 51 | 6 | 0 |
| Profit | £5 | 14 | 0 |
| Loss sending crude liquor to distillers | 166 | 5 | 0 |
| Advantage derived by installing concentrated gas liquor plant | £171 | 19 | 0 |

Against this we have to provide for interest and depreciation, which is covered by a sum of about £40. It is evident, therefore, that I was adequately justified in recommending the installation of the plant.

No elaborate chemical control is necessary in the manufacture of concentrated gas liquor. Indeed, from a series of analyses of various strengths of concentrated gas liquor, it is possible to construct a curve, and determine approximately the content of ammonia in the concentrated gas liquor by using a Twaddel's hydrometer, and correcting to 15° C. The following graph is one which a number of gas engineers are working with to-day, and it affords satisfactory information for controlling the strength of the concentrated gas liquor produced.

It should be remarked that concentrated gas liquor is no more volatile than is gas liquor. This is attributable to the fact that a certain amount of oily matter and crude phenols condense with the steam and ammonia, in the formation of concentrated gas liquor. This oily substance—phenols and pyridine bases—accumulates in the concentrated gas liquor storage tank, and after a time can be sharply separated, by reason of difference of specific gravity, from the concentrated gas liquor itself. I am aware that in the case of one works in the South of England as much as 300 gallons of this oily substance was separated, and upon analysis it was found that it had the following approximate chemical composition:

| | |
|---|---|
| Pyridine bases | 22·5 p.ct. |
| Phenol ,, | 39·5 ,, |
| Distillation characteristics: Drop 88° C. | |
| Totally distilled at | 270° C. |
| 10 p.ct. at | 182° C. |
| 80 ,, ,, | 220° C. |

It is clear, therefore, that if concentrated gas liquor collects crude phenols and pyridine bases, &c., the effluent

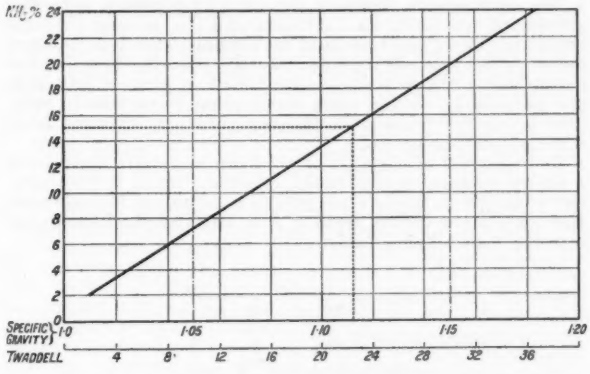



**Diagram 1.—Relationship between Specific Gravity and Percentage of Ammonia in Concentrated Gas Liquor.**

liquor discharged from a concentrated gas liquor plant must be appreciably less toxic than is the effluent liquor discharged in the ordinary course of the manufacture of sulphate of ammonia. In point of fact, it is known that this is the case.

### The Advantage of Concentrated Gas Liquor.

The question will naturally be asked, "What is the advantage of concentrated gas liquor, and to what purpose can it be usefully applied?"

It must be evident to-day that to manufacture ammonium products on a small scale at a relatively large number of works is inexpedient. Fifty tons of sulphate of ammonia per day can be made in one unit of plant with the same labour as is required to manufacture one ton per day. Similarly, if it is desired to manufacture muriate of ammonia, nitrate of ammonia, or ammonium bi-carbonate, it is as easy to manufacture fifty tons per day as it is to manufacture one ton per day, and with suitably designed plant there is certainly no need for more labour in manufacturing fifty tons than there is in manufacturing one ton.

The wisdom, therefore, of converting gas liquor to concentrated gas liquor—the most suitable form for economical subsequent use—at the various gas-works in Scotland, and sending it to one or two central chemical works, which are suitably situated geographically, is obvious.

Sulphate of ammonia plant which has been designed to produce, say, twenty tons of sulphate of ammonia per day from gas liquor can by a simple modification produce fifty tons of sulphate of ammonia per day from concentrated gas liquor, at about half the expense in respect of steam and labour.

The concentrated gas liquor which I have produced at my works is peculiarly suitable for conversion to ammonium bi-carbonate. It has the following approximate analysis:

| | P.Ct. |
|---|---|
| $NH_3$ | 18·93 |
| $CO_2$ | 24·39 |
| $H_2S$ | 0·917 |

It will be seen that the quantity of ammonium sulphide present in the North Berwick quality of concentrated gas liquor is low when contrasted with the concentrated gas liquor prepared from South Yorkshire coals, of which I give two analyses below, relating to concentrated gas liquor arising from such coal:

| *"A" Works.* | P.Ct. | *"B" Works.* | P.Ct. |
|---|---|---|---|
| $NH_3$ | 15·60 | $NH_3$ | 15·00 |
| $CO_2$ | 18·43 | $CO_2$ | 19·10 |
| $H_2S$ | 1·70 | $H_2S$ | 2·10 |

To convert the concentrated gas liquor produced at my works into ammonium bi-carbonate will not necessitate a very elaborate type of plant. By a process which has been

protected, it would seem that what is required is plant such as is represented by diagram 2.

This consists of a combined saturator and carbonating tower, through which concentrated gas liquor is passed, wetting a suitable filling medium, and into which—saturator first and carbonating tower afterwards—the acid-free producer gases are introduced for effecting the carbonatation of the concentrated gas liquor.

Provision is made for circulating the concentrated gas liquor undergoing carbonatation until ammonium bi-carbonate has been formed to such an extent as to admit of ready crystallization when such ammonium bi-carbonate solution is pumped to the crystallizing tanks.

The saturator is specially designed to ensure a very fine stream of producer gas, containing $CO_2$, passing through the distributing pipes, so that maximum contact is obtained between the gaseous medium and the reacting liquid. The operation of the process is controlled in such a way that the incipiently crystallizing ammonium bi-carbonate solution is always present in the saturator, as distinct from the carbonating tower.

The removal of crystals of ammonium bi-carbonate from a filling medium is not easily effected, but it is comparatively simple to pump a magma of ammonium bi-carbonate and its mother liquor from a specially designed saturator into the crystallizing tanks.

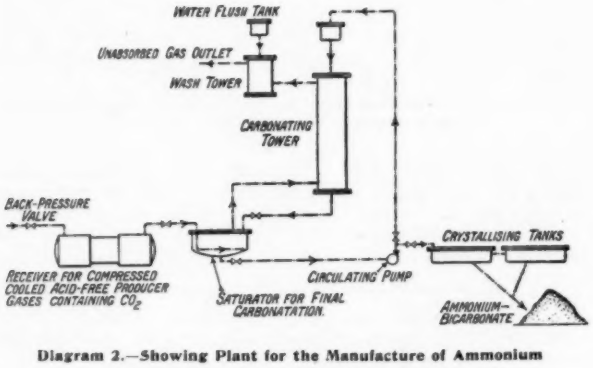



**Diagram 2.—Showing Plant for the Manufacture of Ammonium Bicarbonate from Concentrated Gas Liquor.**

The solubility of ammonium bi-carbonate at 15° C. is 18·5 parts per 100 parts, and it is usual to start with concentrated gas liquor containing at least 15 p.ct. of ammonia, and introduce producer gases containing $CO_2$, and to circulate the concentrated gas liquor until it is supersaturated with ammonium bi-carbonate.

The mother liquor can be re-circulated and can be worked down to as low a concentration, in respect of ammonia, as 5 p.ct., when such mother liquor needs to be pumped to the gas liquor storage tank, and distilled for the manufacture of concentrated gas liquor.

The ammonium sulphide of the concentrated gas liquor is decomposed during the process of carbonatation, and the $H_2S$ is discharged from the final wash-tower and passes to two oxide of iron purifiers, one of which is in use while the other is being revivified. In order to avoid the necessity for a gasholder, it is preferable, in certain circumstances, to pump the acid-free producer gases, containing $CO_2$, into a receiver under pressure, as is shown on diagram 2, and to release these gases at a suitable rate into the saturator, for carbonating the concentrated gas liquor.

Experiments are, I understand, being conducted at Rothamsted, with a view to determining the value of ammonium bi-carbonate as a fertilizer, in substitution, or partial substitution, for sulphate of ammonia, and it is hoped that the trials in question will be of a favourable nature.

On the subject of the extended application of ammonium bi-carbonate, Mr. Parrish has been good enough to direct my attention to the report for 1931, of the Food Investigation Board of the Scientific and Industrial Research, in which there is recorded the fact that experiments have been made on the prevention of mould growths on oranges, by the introduction of crystals of ammonium bi-carbonate into the storage chamber. The crystals, by dissociation, maintain sufficient ammonia in the atmosphere to prevent fungal growth.

Finally, it should be remarked that automatic control is not confined to concentrated gas liquor plants alone, but can be applied to plant for the manufacture of concentrated ammonia liquor—25 p.ct. $NH_3$.

Large quantities of concentrated ammonia liquor have been used in America during the last few years, for the ammoniation of calcium superphosphate. Regarding the possibility of employing concentrated ammonia liquor for the ammoniation of calcium superphosphate, Mr. Parrish has written me on this subject in the following terms:

> "In 1929, 30,000 tons of nitrogen were consumed in the United States for the ammoniation of calcium superphosphate, and the estimated consumption in 1930 was 40,000 to 50,000 tons, expressed in terms of nitrogen. Were it not for the requirements of the law as to the solubility of calcium superphosphate, there is no reason why the ammoniation of calcium superphosphate, which has become so popular in the United States, should not have been adopted in this country, and a market found for large quantities of concentrated ammonia liquor.
>
> "It should be explained that the demand of buyers of calcium superphosphate in different countries varies in two respects: (*a*) the concentration of water-soluble phosphate, and (*b*) the basis of solubility.
>
> "(*a*) Thus, in Sweden the usual grade sold is 20 p.ct. $P_2O_5$, in Germany it is 18 p.ct. $P_2O_5$, and in France 14 p.ct. (*b*) In England and many other countries, such as Austria, Belgium, Denmark, Holland, Germany, Japan, &c., water solubility has to be guaranteed. On the contrary, in France and the United States a guarantee of solubility of calcium superphosphate is understood to mean 'soluble in water and/or in citrate of ammonia.'
>
> "The ammoniation of calcium superphosphate leads to 'reversion;' that is, the conversion of water-soluble phosphoric acid to citrate-soluble phosphoric acid. So long as the law regarding solubility remains what it is in this country, and fertilizer manufacturers are only able to secure a pecuniary realization for the water-soluble phosphoric acid content, the ammoniation of calcium superphosphate by concentrated ammonia liquor is not likely to meet with any considerable measure of success. What is more disappointing, in this connection, is that English superphosphate manufacturers are convinced that the present water-soluble basis for the sale of calcium superphosphate is the more equitable one to the farmers, and in this view they have considerable support from many other countries, such as Austria, Belgium, Denmark, Germany, &c. But it is conceivable that fresh uses may be found for concentrated ammonia liquor, and the position is a promising one."

It is hoped that this contribution may be of interest to small, medium, and large works, and that the information embodied in it will not only stimulate consideration, but may lead to greater interest in the treatment of gas liquor by the more modern methods which have been evolved as a result of present economic exigencies.

That the chief Alkali Inspector is right in deprecating the destruction of gas liquor few will deny. That the destructive methods adopted by some gas-works possess unsuspected concomitant disadvantages will also be conceded.

To manufacture concentrated gas liquor or concentrated ammonia liquor for supply to a central chemical works, or for conversion to other ammonium products at certain suitable existing gas-works, would undoubtedly appear to be a rational solution of the present-day bye-product ammonia problem.

### Discussion.

The PRESIDENT said that Mr. Philp had made out a good case for the concentration of gas liquor. It was a paper which came opportunely, and contained a number of valuable suggestions.

Mr. JAMES BELL (Dumbarton) thought the author had taken a notable step in tackling what had hitherto been a losing proposition for him. He had dealt with his problem in a courageous way, and transformed matters to such an extent that he was now making a profit. As was well known, the sulphate of ammonia market had been most adversely affected; and, of course, it did seem a pity that a valuable product such as raw liquor should be allowed to run to waste. In a careful and methodical way, the author had outlined the initial process which was necessary in any working-up of a project of the nature described. There seemed to be possibilities in the idea, and it was conceivable that the initial process might develop into a complete process.

Mr. DAVID VASS (Perth) remarked that, as he had been forced to continue making sulphate of ammonia at a loss, the paper by Mr. Philp would be most useful to him.

Mr. JOHN WILSON (Dundee) felt it was a pity that this paper should have come up for reading and discussion so late in the day, when the time for comment and criticism was limited.

Mr. PHILP, in acknowledging the complimentary observations, said not only was there an existing market for ammonium bi-carbonate, but he thought it would eventually turn out to be a very large market. Certain experiments were going on at the moment which he, and others, believed would prove favourable.

# GAS AT THE BUILDING EXHIBITION

*A comprehensive display of gas appliances arranged by firms in the Industry at Olympia*

The Building Exhibition, which opened at Olympia on Sept. 14, and is running until Sept. 28, marks the eighteenth of the series held biennially under the same control. On this occasion the Rt. Hon. W. G. A. Ormsby-Gore, M.P. (First Commissioner of Works), formally declared the Exhibition open.

Despite the general depression of trade, in which the building industry is, perhaps, one of the principal sufferers, Olympia has this year been filled by exhibitors to its utmost capacity, and the Gas Industry is well represented in almost every phase of its usefulness, in so far as it can be of invaluable service to the architect and builder in the design and planning of new buildings and in the equipment and furnishing of the finished product.

### Gas Light and Coke Company.

The Gas Light and Coke Company have a large and attractive stand, containing a wide selection of the most modern gas appliances for cooking, room warming, the supply of hot water, refrigeration, central heating, lighting, and other domestic and office uses to which gas can be applied.

Mr. Walter J. Tapper, A.R.A., has designed the exhibit which includes model kitchens equipped with the latest gas appliances such as all-enamel cookers, thermal storage and instantaneous gas water heaters, refrigerators, washcoppers, washing machines, gas irons, clothes drying and airing cabinets. Other sections contain gas fires, radiators, central heating apparatus, modern gas lighting fittings which can be controlled from a distance by switches, and gas pokers for lighting solid fuel boilers or fires. Special open grates for burning "Cleanglow" smokeless fuel can also be inspected. These grates are fitted with a gas burner which lights the "Cleanglow" in 10 to 15 minutes.

A feature of interest to builders is the display of gas fires finished in a range of six colours. These colours have been selected so that fires can now be supplied to harmonize with almost any colour decoration scheme. The Company retain a special staff of expert representatives to supply architects and builders with advice or specifications for gas installations for any buildings which they may be erecting in the Company's area of supply.

### South Metropolitan Gas Company.

The exhibit of the South Metropolitan Gas Company demonstrates how the services, such as lighting, heating, cooking, and water-heating, which make for greater comfort and convenience in a house, can be supplied by modern "Metro" gas equipment in an attractive and efficient manner. Where open fires are desired, there are in "Metro-Coalite" and "Metro" coke two smokeless solid fuels which give complete satisfaction in use. "Metro-Coalite" ignites easily and burns brilliantly in any open grate. "Metro" coke grates are made in styles and sizes to suit every kind of fireplace: (1) Inset, for building into existing fireplaces; (2) unit, for fitting into suitable fireplaces; (3) independent, for standing in front of fireplaces which present difficulties in conversion, or in any position where a suitable flue and hearth are available; (4) basket, for standing in open chimney pieces; and (5) mantel register, for housing schemes. The complete unit comprises a fire and overmantel.

The "Lumetro" fire is shown in operation, which is an attractive appliance operated by gas, but giving the appearance of a glowing solid-fuel fire, with flickering flames on top. The new "oven-on-top" cooker, which is understood to be selling very well, is also exhibited.

### A Glance Round.

The stand of Messrs. Asbestos Cement Building Products, Ltd., of Trafford Park, Manchester, has been arranged to exhibit examples of the application of the many well-known A.C.B.P. asbestos-cement materials, and to demonstrate the remarkable developments that have been made in recent years. In cubicles various fitments have been erected showing the application of "Everite" flue fittings and asbestos cement bathroom fittings. Various displays of "Everite" pressure pipes, for water-mains, gas-mains, and electricity conduits, "Serval" asbestos felt, &c., have also been arranged on the stand.

Messrs. Cellactite and British Uralite, Ltd., of Lincoln House, 296-302, High Holborn, W.C. 1, are showing Cellactite steel cored corrugated roofing sheets in variety, including ridging, flashing, louvre blades, &c., in the same material. "Urastone" incorrosible fluepipes and fittings as used with gas appliances and solid fuel stoves are shown in very interesting assortment. Cowls of various types, bafflers, bends, tees, &c., in numerous internal diameters, are included in the "Urastone" range.

A novel "Urastone" feature is the satisfactory employment of the product for ventilating ducts, trunking, &c., actual specimens of which are exhibited.

Multipoint and storage water heaters are displayed by Messrs. Clarkhills, Ltd., of 31, Vauxhall Bridge Road, London, S.W. 1. The Clarkhill thermostatically-controlled multipoint water heater is a machine made of copper and brass, and is usually fitted in the kitchen or scullery, and supplies hot water all over the house, simply by turning of the tap, wherever hot water is required, anywhere in the house. This machine can be adapted to the existing boiler system, so that either service can be used at will, utilizing the same branch pipes and taps. This applies particularly in the summer, when the boiler is not in use. The Clarkhill can be obtained in any finish desired to suit the decorations, or to the client's taste, also a new feature is the thermostat, which makes the machine definitely foolproof.

The Clarkhill "Vauxhall" is a thermostatically-operated water heater storing 2 gallons of hot water, being ideal to fit over the sink or hand basin, and is especially suitable for doctors, dentists, &c., as it is supplied with a very compact mixing tap. Directly the full amount of water contained in the heater reaches 180° Fahr., the thermostat comes into operation and closes down the gas supply, so that the two small jets are reduced to a minimum.

Messrs. Cookers & Geysers, Ltd., of 244, High Holborn, W.C. 1, are making a special display of their "Ascot" white porcelain enamelled multi-point gas water heaters, which supply hot water to bath, basin, and sink, instantaneously and in any quantity, simply by the turn of a tap.

The "Ascot" bath geyser (Type R.25) is also exhibited while the "Perfecta" automatic temperature regulator is shown working. This gives absolute precision and reliability in keeping a constant temperature, and is applicable to all gas heated installations.

### Complete Kitchen Suites.

The Davis Gas Stove Company, Ltd., and the Nautilus Fire Company, Ltd., of 7, Stratford Place, W. 1, are making displays of complete kitchen suites, each consisting of "Nautilus" domestic coke boiler and gas cooker. In addition, there are examples of "Nautilus" cast-concrete gas flues, including a built-up section. Further exhibits include specimens of "Marblate" surrounds and mantelpieces with gas fires, cast gas mantle registers, together with a working display of geysers, embracing the "Clover," the "Alpine," in white porcelain enamel finish with chromium-plated fittings, and the "Lilac."

Various types of kitchen cabinets are being shown by Messrs. Easiwork, Ltd., of 242, Tottenham Court Road, W. 1, which are designed to meet varied requirements, while several new models are featured on the stand. This firm are also makers of an attractive gas cooker, which they produce in coloured finishes to match their kitchen sets.

The exhibit of Messrs. Electrolux, Ltd., of 153-155, Regent Street, W. 1, includes a range of gas refrigerators from 1 to 7 c.ft. capacity. Larger cabinets are available, but those shown cover the most popular domestic models. Particular attention is drawn to the "built-in" cabinets which are supplied in the rough with only a priming coat of paint, so that they may be incorporated in a cupboard scheme and finished to match the general decoration of the kitchen. Among the cabinets shown is the "Freezolux" "Minor."

On the stand of Messrs. Ewart & Son, Ltd., of 346, 348, and 350, Euston Road, N.W. 1, are several new types of geysers of interest. With the continuous flow automatic "Vivo" water heater no storage is necessary, and an unlimited supply of hot water is guaranteed to any tap in the house at any hour of the day or night. The "Victor"

geyser de-luxe with hard-fired porcelain enamelled case is of beautiful finish and appearance and a most attractive fitting for any bathroom. For a hot water service to kitchen sink or lavatory basin the "Allhot" container type of water heater is recommended, while the "Storit" three-cornered bath heater to fit any corner space fills a long-felt want. Messrs. Ewart's are also exhibiting samples of their well-known all-copper ventilators and the "Emperor" smoke cure.

Messrs. Fenlon & Son, Ltd. (Incorporating G. Shrewsbury & Co.), of 8-10, Tudor Street, London, E.C. 4, are exhibiting their geysers, storage heaters, boilers, heating apparatus, for gas, oil, electricity, wood, coke, &c., suitable for all town and country requirements. There is a large range of white porcelain enamelled geysers with chromium-plated fittings. The "Whitehot" geyser is shown at work, fitted with accessible base with cleaning doors and a new design of removable burner patented safety pilot gas tap. There are also shown models of the "White Knight" and "White Swan."

### "Leamington" Unit Fires.

The stand of Messrs. Sidney Flavel & Co., Ltd., of Leamington, has a comprehensive display of modern domestic heating and cooking appliances. Their gas cooker is made in types and sizes to suit almost any requirements—from fine cast to high-grade enamel finishes. One model is shown with a glass-fronted oven door. The "Leamington" unit fires are particularly emphasized on the stand, forming as they do a most effective method of adapting domestic fires to suit the season. By this scheme coke, gas, or electric fires may be fixed into the ordinary coal fireplace at a moment's notice. The "Metro" coke fire is shown in all forms, including the "Metro-Log" imitation log gas fire, mantle registers for coal, coke, or gas, ordinary gas fires and inset fires. A new type of portable gas heater is also shown.

The Four Oaks Spraying Machine Company, of Sutton Coldfield, are exhibiting all types of "Four Oaks" spraying machines for lime-washing, disinfecting, painting, distempering, &c. These machines are made in many sizes and prices from 3½ gallons capacity upwards.

Galvanized mild steel tanks, cisterns, cylinders, mild steel gutters and pipes, ventilating panels, pipe guards, radiator covers, perforated metal screens, &c., are among the many interesting exhibits of Messrs. G. A. Harvey & Co., Ltd., of Greenwich Metal Works, Woolwich Road, Charlton, S.E. 7.

Among the exhibits of the Hurry Water Heater Company, of 39, Broad Street, Birmingham, is the "Hurro" dual-purpose clothes washer, which also provides hot water for bath purposes on the overflow method. The "Magic" patented water heater and circulator is also shown—the firm's newest machine for attaching to existing hot water circulation pipes, providing hot water to all points, including hot airing cupboard service. The firm's new "Hexagon" water heater and circulator attachment is a cast non-corrosive article, for the builder of small villas wishing to provide hot water, including airing cupboard for summer without lighting the coal fire.

The National Radiator Company, Ltd., of Hull, have a comprehensive exhibit of "Ideal" appliances for heating and hot water supply, including their "Classic" and "Domestic" appliances in coloured vitreous enamel finishes. Gas radiators of many different sizes are shown, in addition to the well-known "Rayrad" radiator, and towel rails in round, square, and hexagonal tubing. The firm's "Cookanheat" apparatus with auxiliary gas cooking attachment is also in evidence.

An up-to-date display of geysers and storage water heaters for use with gas, oil, or wood fuel is to be seen on the stand of Messrs. New Geysers, Ltd., of 25 and 27, Addington Square, S.E. 5, these being finished in porcelain enamel in various colours to meet the requirements of the modern bathroom. The "White Chief" and "White Ensign" models are noteworthy examples.

The increasingly important part played by the Gas Industry in modern housing is well illustrated by a visit to the stand of the Parkinson Stove Company, Ltd., of Stechford, Birmingham, and 8 and 10, Grosvenor Gardens, Victoria, S.W. 1. The display is representative of the firm's well-known cooking and heating appliances and includes examples of their latest geysers. The gas cookers are typical of the latest developments in this class of apparatus, being attractively finished in porcelain enamel, and fitted with the improved "Ajusto" oven heat controller for automatic cooking.

In the heating section two new panel fires in colour finishes, and the new "Curvex" fire will attract attention. In the latter fire the specially curved radiants which

STANTON
DELAVAUD
Spun Iron Pipes
3, 4, 5 and 6 Yards Long
STANTON SPUN 6 YARDS LONG
STANTON SPUN 5 YARDS LONG
STANTON SPUN 4 YARDS LONG
STANTON SPUN 3 YARDS LONG
The Stanton Ironworks Company Limited Nr. Nottingham

are fitted follow the natural curve of the flame, resulting, it is claimed, in a more effective heat distribution than in the usual type of inclined fire. An example of the "Indusa" heater (Gas Light and Coke Company design) is also shown. In connection with water heating, the latest pattern "Treasure" geyser in cream enamel finish with chrome plated fittings, is on view, and also a new type "Pearl" geyser.

A wide range of geysers in attractive finishes is shown on the stand of the Pollard Engineering Co., Ltd., of 50, Farringdon Street, E.C. 4.

Hot water supply and central heating for all household and industrial purposes is exemplified on the stand of Messrs. Thomas Potterton (Heating Engineers), Ltd., Cavendish Works, Ravenswood Road, Balham, S.W. 12. Working examples are shown of automatic gas-fired thermal storage water heaters. "Empire" and "Emperor" boilers, "Emperor" thermal storage sets and multiple "Empire" sets for bulk supply operated automatically by bi-metal thermostat. Demonstrations are given of bi-metal thermostats and other forms of automatic control. In addition there are examples of gas-fired central heating boilers (30,000 to 250,000 B.Th.U. per hour), and low-pressure water heating with the "Magnetic" distance control thermostat. Coke boilers for central heating, radiators, towel dryers and accessories are included in this interesting display.

Messrs. W. H. Sugden & Co., Ltd., of Glenny Road, Barking, E., are showing their "Blick" hygienic dish and clothes washer and gas copper combination. This apparatus washes clothes automatically, and, in 10 seconds, can be converted into a machine which washes dishes and dries them—without breakage, damage to the finest material, or the soiling of the hands. It can be used as a one-purpose gas copper by the simple attachment of a gas flex, and takes up no more space than those in general use.

Among other exhibitors of interest to the Gas Industry are the Expanded Metal Company, Ltd., of Burwood House, Caxton Street, S.W. 1, whose display consists of specimens of various meshes and weights of "Expamet" expanded steel, and also Messrs. Thomas & Bishop, of 37, Tabernacle Street, E.C. 2, who are exhibiting examples of their flux solders.

## Corporation Undertakings' Results.

**Glastonbury.**

Alderman J. Coleby Morland reported that at the close of the year the capital expenditure out of loans outstanding stood at £48,430 out of the total loans, and the amount paid off up to that date had been £47,769. They had paid off up to the end of last year practically as much as the outstanding loans amounted to. With regard to the revenue account, that was reasonably satisfactory. There was a slight increase in the amount of gas sold, about three-quarters of a million c.ft. There had been a satisfactory decrease in the amount of loss from leakage—namely, about 400,000 c.ft. The general result had been that the revenue account amounted to £7266. That sounded pleasing, and as indicating that reasonable profit had been made, but there were certain charges that came against that, including interest £2665, repayment of loans £2554, income-tax £982, less £669 recovered, leaving net tax £313. Other payments which had to be deducted reduced the profits to £259, which brought their profits up to a total of £2071 to be carried forward. Dealing with the cost of gas manufacture, including coal, retorts, work and maintenance, it worked out at 32½d. per 1000 c.ft. The residuals sold came to about 13¾d. per 1000, and that brought the cost back to 18¾d. The cost of distribution to houses, the maintenance of services, meters, boilers, stoves, and fittings worked out at 15½d. per 1000 c.ft., rates and taxes to 4¾d., management expenses, including office charges, 6½d. The total cost of distribution and supply came to 43¾d. per 1000. They received rents for cookers and certain other things which worked out at about 11½d. per 1000, which reduced the cost to about 32d. per 1000. In addition to that, they had to meet the loan charges, income-tax, &c., totalling to 30½d. per 1000, bringing the total cost to 62½d. per 1000.

## Gas Acts (1920 and 1929) Orders.

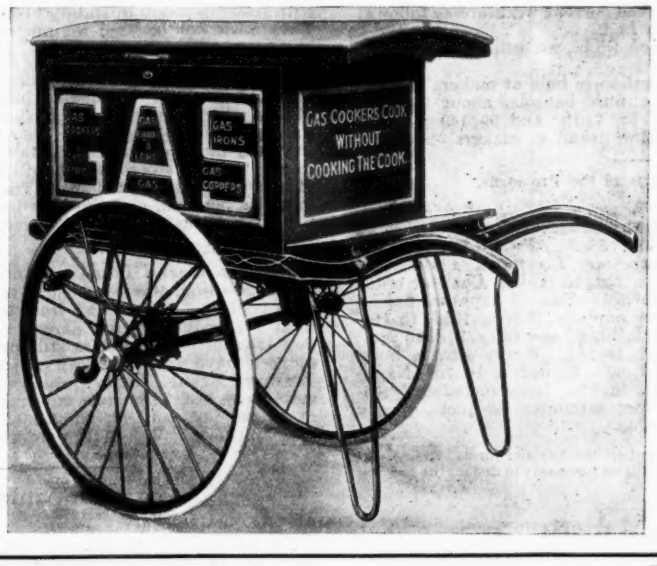
**SPECIAL ORDER.**

**Watford and St. Albans Gas Company.**

To provide for the transfer to the Company of the undertaking of the Welwyn and Hatfield Gas Company, Ltd.; to authorize an increase in the capital of the Company; to make provision in regard to the price to be charged for gas supplied within the limits of the Welwyn Company; and for other purposes.


# The Model Coin Collector

Reduced Prices




Painted and lettered as required

*TELEPHONES*

Manchester 2289
Collyhurst
Nottingham 75202
Watford 2645

*TELEGRAMS*

Sawer, Manchester
Sawer, Nottingham
2645, Watford

THE ORIGINAL and STILL THE BEST

*Sole Makers:—*

SAWER & PURVES

(Branch of Meters Ltd.)

NELSON METER WORKS MANCHESTER
14, DERBY ROAD WATFORD
RADFORD METER WORKS NOTTINGHAM

# GAS MARKETS & MANUFACTURES

## Stock Market Report.

[For Stock and Share List, see later page.]

Business on the Stock Exchange suffered a severe set-back at the commencement last week owing to the fall in commodities and the unsatisfactory advices from Wall Street. These led to a rush of selling orders on the part of speculators, which caused a general marking down of prices; but with this element out of the market investment buying was resumed, and prices again showed an upward tendency. British Funds were particularly strong, several showing gains of from 1 to 1½ points on the week, while assented War Loan went to over par.

The Gas Market remained undisturbed by any outside influences, and the comparatively small supplies of stock available were speedily absorbed. Prices generally continued very steady, there being only two changes of note. A sharp rise of 12 points to 102½ occurred in Hastings and St. Leonards 3½ p.ct., and a gain of 4 points to 104½ was registered by Cardiff consolidated. Both these stocks have been rather undervalued for some time, and even at current prices the yields are still attractive. The Hastings Company has distributed 5½ p.ct. per annum since 1928, and the yield works out at £5 7s. 3d.; while the Cardiff Company has paid 6 p.ct. per annum since 1922, the return in this case being £5 14s. 10d. Another stock in the List which is standing at a low figure is that of the Portsmouth 5 p.ct. maximum, which at 90½ gives a yield of £5 10s. 6d. p.ct.

The report and accounts of the Alliance and Dublin Consumers' Company for the half-year to June 30 show a profit on the revenue account of £64,010 (against £70,861 for the corresponding period 1931), and, after providing for interest and income-tax, there remains a balance of £53,021, which, together with £36,523 brought in from the last account, makes a total of £89,544 available. The Directors propose to pay a dividend of £7 12s. 6d. p.ct. per annum (the same), leaving £30,379 to be carried forward.

## Current Sales of Gas Products.

### The London Market for Tar Products.

LONDON, *Sept.* 19.

The prices of tar products for the current week are as follows: Pitch, 95s. to 97s. 6d. per ton f.o.b.

Creosote, 3½d. to 5d. per gallon f.o.b., according to specification.

Refined tar is 4d. to 4½d. per gallon in bulk at makers' works.

Pure toluole is about 2s. 7d.; pure benzole, about 1s. 11d.; 95/160 solvent naphtha, about 1s. 7½d.; and 90/140 pyridine bases, 3s. 9d. to 4s.—all per gallon naked at makers' works.

### Tar and Tar Products in the Provinces.

*Sept.* 19.

The average prices of gas-works products during the week were: Gas-works tar, 33s. to 38s. Pitch—East Coast, 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. f.o.b.* Toluole, naked, North, 1s. 7½d. to 1s. 9d. Coal-tar crude naphtha, in bulk, North, 5½d. to 5¾d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 4½d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2¼d. to 2¾d.; low gravity, 1¼d.; Scotland, 2¼d. to 2¾d. Heavy oils, in bulk, North, 4¾d. to 5¼d. Carbolic acid, 60's, 1s. 6½d. to 1s. 7d. Naphthalene, £9 to £10. Salts, 35s. to 75s., bags included. Anthracene, "A" quality, 2¾d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

### Tar Products in Scotland.

GLASGOW, *Sept.* 17.

Few orders have been placed during the week, but quotations are fairly steady, although possibly actual business could be arranged at fractionally lower levels.

Crude gas-works tar.—Actual value is 50s. to 52s. 6d. per ton *ex* works.

Pitch.—Value continues firm at 85s. to 90s. per ton f.o.b. Glasgow for export, and 90s. to 100s. per ton *ex* works for home trade.

Refined tar to Ministry of Transport specification is slightly easier at 4d. to 4¼d. per gallon f.o.r. in buyers' packages.

Creosote oil.—A steady throughput is maintained locally and prices are unchanged. B.E.S.A. Specification is 3½d. to 3¾d. per gallon; low gravity, 3¾d. to 4d. per gallon; and neutral oil, 3¾d. to 4d. per gallon—all *ex* works in bulk.

Cresylic acid.—This remains a dull market with values nominal. Pale, 97/99 p.ct., is 1s. to 1s. 1d. per gallon; dark, 97/99 p.ct., 11d. to 1s. per gallon; and pale, 99/100 p.ct., 1s. 2d. to 1s. 3d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha.—Supplies are not plentiful, but value remains at 4½d. to 5d. per gallon, according to quality.

Solvent naphtha.—Quotations are easy at 1s. 2d. to 1s. 3d. per gallon for 90/160 grade, and 11d. to 1s. per gallon for 90/190 grade.

Motor benzole.—Owing to increase in price of petrol, this is now valued at 1s. 4d. to 1s. 5d. per gallon f.o.r. in bulk, but stocks are low and little business is being arranged.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

### Benzole Prices.

These are considered to be the market prices for benzole at the present time.

| | s. d. | | s. d. | |
|---|---|---|---|---|
| Crude benzole . . . . | 0 10½ | to | 0 11 | per gallon at works |
| Motor ,, . . . . | 1 6½ | ,, | 1 7 | ,, ,, ,, |
| Pure ,, . . . . | 1 10 | ,, | 1 11 | ,, ,, ,, |

## Contracts Advertised To-Day.

**Coal.**

The Belfast Corporation Gas Department invite tenders for coal. [Advert. on p. 656.]

The Directors of the Newton Gas and Coke Company invite tenders for the supply of coal. [Advert. on p. 655.]

## Trade Notes.

**Keith Quiet-Running Compressors.**

From Messrs. Blackman Export Company, Ltd., of 374, Euston Road, N.W. 1, we have received a leaflet descriptive of the firm's compressor unit, which is of the positive rotary type with packing pieces in sliding blades operated by eccentric drum. They must not be used for unclean air or gas.

**Works Extension at Luton.**

Electrolux, Ltd., have decided to extend their Luton Works, to build new offices, and to increase productive capacity by utilizing for manufacturing purposes the space occupied by the present offices. The scheme also provides for the erection of a receiving depôt and raw materials store, as well as an extension to the finished stores, which will accommodate some thousands of the Company's products. The work is being expedited as much as possible, and the new building is expected to be completed in about five months' time.

**An Old-Established Firm.**

Messrs. Clark's Lead and Colour Works Company, Queen's Road, Reading, was established in 1832, and the lead press has been continuously working from that date. The firm has had a most successful business career, and, notwithstanding present-day trading conditions, is still progressing. Many of the employees have seen between 20 and 40 years' service. The Trustees, Messrs. Henry Jordan and Sam W. Gyngell, met the employees last Thursday morning, and to mark the occasion extra holidays and an additional week's wages were given to each workman. The staff were also suitably recognized.

## Gas Companies' Results.

**Alliance and Dublin.**

The accounts of the Alliance and Dublin Consumers' Gas Company for the half-year ended June 30 last show a profit on the revenue account of £64,101, and, after providing for interest on debenture stock, interest on temporary loans, and income-tax, there remains the sum of £53,021, to which must be added the sum of £36,523, being the balance brought from the last account, making a total of £89,544. The Directors recommend the declaration of a dividend on the consolidated ordinary stock of the Company at the rate of £7 12s. 6d. p.ct. per annum (this being the maximum statutory dividend permissible under the sliding-scale provisions, when gas is sold at the rate obtaining during the half-year concerned), less income-tax, which will absorb the sum of £59,164, after which a balance of £30,379 will remain to be carried to the next account.

# STOCK AND SHARE LIST.

**Official Quotations on the London and Provincial Stock Exchanges.**

**[For Stock Market Report, see earlier pages.]**

| Issue | Share. | When ex-Dividend. | Dividends. Prev. Hf. Yr. | Dividends. Last Hf. Yr. | NAME. | Quotations. Sept 17. (Provincial Exchange Sept. 16. | Rise or Fall on Week. | Transactions. Lowest and Highest Prices During the Week. |
|---|---|---|---|---|---|---|---|---|
| £ | | | % p.a. | % p.a. | | | | |
| 1,551,868 | Stk. | Apl. 4 | 7½ | 7½ | Alliance & Dublin Ord. ... | 100—110 | ... | 109½ |
| 374,000 | ,, | July 4 | 4 | 4 | Do. 4 p.c. Deb. ... | 80—90 | ... | ... |
| 557,655 | ,, | Aug. 22 | 7 | 7 | Barnet Ord. 7 p.c. ... ... | 132—142 | ... | ... |
| 300,000 | 1 | Apl. 29 | 1/4⅛ | 1/9⅞ | Bombay, Ltd. ... ... | 19/—21/- | +1/16 | 20/6 |
| 177,750 | Stk. | Aug. 22 | 9 | 9½ | Bournemouth sliding scale | 177—187 | ... | ... |
| 550,050 | ,, | ,, | 7 | 7 | Do. 7 p.c. max. ... | 134—144 | ... | 134—142 |
| 439,160 | ,, | ,, | 6 | 6 | Do. 6 p.c. Pref. ... | 128—133 | ... | ... |
| 50,000 | ,, | June 20 | 3 | 3 | Do. 3 p.c. Deb. ... | 70—75 | ... | ... |
| 162,025 | ,, | ,, | 4 | 4 | Do. 4 p.c. Deb. ... | 90—95 | ... | 95—97 |
| 210,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Deb. ... | 115—120 | ... | ... |
| 357,900 | ,, | Aug. 22 | 7½ | 7½ | Brighton, Hove, & Worthing 6 p.c. Con. ... | 135—145 | ... | ... |
| 540,000 | ,, | ,, | 6⅔ | 6⅔ | Do. 5 p.c. Con. ... | 120—130 | ... | 127—127½ |
| 195,500 | ,, | ,, | 6 | 6 | Do. 6 p.c. B Pref. | 127—132 | ... | ... |
| 1,287,500 | ,, | Aug. 8 | 5 | 5 | Bristol 5 p.c. max. ... ... | 105—107[a] | −1 | ... |
| 120,420 | ,, | June 20 | 4 | 4 | Do. 1st 4 p.c. Deb. ... | 94—96[a] | +2 | ... |
| 217,870 | ,, | ,, | 4 | 4 | Do. 2nd 4 p.c. Deb. ... | 93—95[a] | +2 | ... |
| 328,790 | ,, | ,, | 5 | 5 | Do. 5 p.c. Deb. ... ... | 115—120[a] | ... | ... |
| 855,000 | ,, | Apl. 4 | 7 | 8 | British Ord. ... ... ... | 128—138 | −2 | 130 |
| 100,000 | ,, | June 20 | 7 | 7 | Do. 7 p.c. Pref. ... ... | 120—130 | ... | ... |
| 350,000 | ,, | — | — | — | Do. 5½ p.c. Pref. ... | 107—112 | ... | ... |
| 120,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Red. Deb. ... | 87—92 | ... | 91½ |
| 450,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 105—115 | ... | ... |
| 160,000 | ,, | July 4 | 5 | 5 | Cambridge 5 p.c. Deb. ... | 114—119 | ... | ... |
| 100,000 | 10 | May 23 | 6 | 6 | Cape Town, Ltd. ... ... | 7½—8½ | ... | 7⅝ |
| 100,000 | 10 | Apl. 29 | 4½ | 4½ | Do. 4½ p.c. Pref. ... | 6—7 | ... | ... |
| 150,000 | Stk. | June 20 | 4½ | 4½ | Do. 4½ p.c. Deb. ... | 87—92 | ... | ... |
| 626,860 | ,, | Aug. 8 | 6 | 6 | Cardiff Con. Ord. ... ... | 102—107 | +4 | 103—105½ |
| 237,860 | ,, | July 4 | 2⅝ | 5 | Do. 5 p.c. Red. Deb. | 105—110 | ... | 105 |
| 157,150 | ,, | Aug. 8 | 6½ | 5 | Chester 5 p.c. Ord. ... ... | 89—94[b] | ... | ... |
| 98,936 | 1 | May 23 | 2/- | 2/- | Colombo, Ltd. Ord.... ... | 26/—31/- | ... | ... |
| 24,500 | 1 | ,, | 1/4⅛ | 1/4⅛ | Do. 7 p.c. Pref. | 18/—20/- | ... | ... |
| 609,204 | 1 | Apl. 4 | -/10'90 | -/11'47 | Colonial Gas Assn. Ltd. Ord. | 10/—15/- | ... | ... |
| 296,053 | 1 | ,, | 1/2'54 | 1/3'30 | Do. 8 p.c. Pref. | 10/—15/- | ... | ... |
| 2,078,280 | Stk. | Aug. 8 | 5⅔ | 5 | Commercial Ord. ... ... | 102—107 | ... | 104—105½ |
| 475,000 | ,, | June 20 | 3 | 3 | Do. 3 p.c. Deb. ... | 70—75 | ... | ... |
| 807,560 | ,, | Aug. 8 | 7 | 7 | Croydon sliding scale ... | 130—140 | ... | ... |
| 469,590 | ,, | ,, | 5 | 5 | Do. max. div. ... ... | 95—100 | ... | 96 |
| 500,000 | ,, | July 4 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 115—120 | ... | 116—119 |
| 542,270 | ,, | Aug. 8 | 10 | 7 | Derby Con. ... ... ... | 120—130[c] | ... | ... |
| 55,000 | ,, | July 4 | 4 | 4 | Do. 4 p.c. Deb. ... ... | 75—85[c] | ... | ... |
| 209,000 | ,, | Sept. 5 | 5 | 5 | East Hull Ord. 5 p.c. ... | 93—98* | ... | ... |
| 179,500 | ,, | Aug. 22 | 5⅔ | 6 | East Surrey Ord. 5 p.c. | 108—118 | ... | ... |
| 155,019 | ,, | June 20 | 5 | 5 | Do. 5 p.c. Deb. ... | 114—119 | ... | ... |
| 1,002,180 | ,, | Mar. 14 | †4 | †6⅔ | European, Ltd. ... ... | 112—122 | ... | 118—126⅔ |
| 19,405,992 | ,, | Aug. 8 | 5⅔ | 5⅔ | Gas Light & Coke 4 p.c. Ord. | 22/—24/-[f] | ... | 22/3—22/9 |
| 2,600,000 | ,, | ,, | 3½ | 3½ | Do. 3½ p.c. max. ... | 77—82 | ... | ... |
| 4,477,106 | ,, | ,, | 4 | 4 | Do. 4 p.c. Con. Pref. ... | 95—100 | ... | 96—98½ |
| 6,102,497 | ,, | June 20 | 3 | 3 | Do. 3 p.c. Con. Deb. ... | 75—78 | −1 | 76—77½ |
| 3,642,770 | ,, | ,, | 5 | 5 | Do. 5 p.c. Red. Deb. ... | 108—113 | ... | 111—111½ |
| 2,500,000 | ,, | ,, | 4½ | 4½ | Do. 4½ p.c. Red. Deb. ... | 105—110 | ... | 106⅔—107½ |
| 264,011 | ,, | Aug. 22 | — | 6 | Harrogate New Cons. ... | 104—109 | ... | ... |
| 82,500 | ,, | Aug. 22 | 7 | 7 | Hastings & St. L. 5 p.c. Conv. | 118—128 | ... | 126 |
| 258,740 | ,, | ,, | 5½ | 5½ | Do. 3½ p.c. Conv. | 100—105 | +12 | 103—104 |
| 70,000 | 10 | June 6 | ‡5 | ‡10 | Hongkong & China, Ltd. ... | 10—11 | ... | ... |
| 313,200 | Stk. | Aug. 22 | 6 | 6 | Hornsey Con. 3½ p.c. ... | 103—108 | ... | ... |
| 5,600,000 | ,, | June 6 | 15 | 14 | Imperial Continental Cap. | 187—197 | +2 | 187—194 |
| 223,130 | ,, | Aug. 8 | 3½ | 3½ | Do. 3½ p.c. Red. Deb. | 81—86 | ... | ... |
| 235,242 | ,, | Aug. 8 | 8½ | 8½ | Lea Bridge 5 p.c. Ord. ... | 142—152 | ... | ... |
| 2,145,907 | ,, | Aug. 22 | 6 | 6 | Liverpool 5 p.c. Ord. ... | 108—110[b] | ... | ... |
| 245,500 | ,, | June 20 | 5 | 5 | Do. 5 p.c. Red. Pref. ... | 100—110[b] | ... | ... |
| 306,083 | ,, | July 15 | 4 | 4 | Do. 4 p.c. Deb. ... | 85½—90½[b] | ... | ... |
| 165,786 | ,, | Sept. 5 | 10 | 8 | Maidstone 5 p.c. Cap. ... | 150—160* | ... | ... |
| 56,176 | ,, | June 20 | 3 | 3 | Do. 3 p.c. Deb. ... | 65—70 | ... | ... |
| 76,000 | 5 | June 20 | †10 | †10 | Malta & Mediterranean ... | 7½—8½ | ... | ... |
| 892,000 | — | Apl. 1 | 5½ | 5½ | Metropolitan (of Melbourne) 5½ p.c. Red. Deb. ... ... | 95—100 | ... | ... |
| 171,978 | Stk. | Sept. 5 | 5 | 5 | M. S. D. Utility "C." Cons. | 86—91* | ... | 85 |
| 718,657 | ,, | ,, | 4 | 4 | Do. 4 p.c. Cons. Pref. | 80—85* | ... | ... |
| 112,126 | ,, | July 4 | 4 | 4 | Do. 4 p.c. Deb. ... | 87—92 | ... | ... |
| 148,955 | ,, | ,, | 5 | 5 | Do. 5 p.c. Deb. ... | 105—110 | ... | ... |
| 675,000 | ,, | 21 May '31 | 16 | 16 | Montevideo, Ltd. ... ... | 40—60 | ... | ... |
| 2,061,815 | ,, | Aug. 8 | 5⅔ | 5 | Newcastle & Gateshead Con. | 19/9—20/9[d/] | ... | ... |
| 682,856 | ,, | ,, | 4 | 4 | Do. 4 p.c. Pref. ... | 90—91[d] | ... | ... |
| 691,705 | ,, | June 20 | 3½ | 3½ | Do. 3½ p.c. Deb. ... | 84—86[d] | ... | ... |
| 277,285 | ,, | Apl. 29 | 5 | 5 | Do. 5 p.c. Deb. '48... | 105—110[d] | ... | ... |
| 274,000 | ,, | Aug. 8 | 5 | 5 | Newport (Mon.) 5 p.c. max. | 86—88[a] | ... | ... |
| 199,940 | ,, | Aug. 22 | 7½ | 7½ | North Middlesex 6 p.c. Con. | 135—145 | ... | ... |
| 396,160 | ,, | Aug. 8 | 5 | 5 | Northampton 5 p.c. max. ... | 88—93 | ... | ... |
| 300,000 | ,, | Apl. 18 | 9 | 7 | Oriental, Ltd. ... ... | 85—95 | ... | ... |
| 205,162 | ,, | June 20 | 8 | 8 | Plym'th & Stonehouse 5 p.c. | 140—150 | ... | ... |
| 504,416 | ,, | Aug. 22 | 8 | 8 | Portsm'th Con.Stk. 4 p.c.Std. | 137—147 | ... | 142—143 |
| 241,446 | ,, | ,, | 5 | 5 | Do. 5 p.c. max. ... | 88—93 | ... | ... |
| 114,000 | ,, | Aug. 8 | 5 | 5 | Preston 5 p.c. Pref. ... ... | 100—105 | ... | ... |
| 686,312 | ,, | July 18 | 4 | 4 | Primitiva 4 p.c. Rd. Db. 1911 | 75—80 | ... | ... |
| 389,813 | ,, | June 20 | 4 | 4 | Do. 4 p.c. Cons. Deb. | 76—81 | ... | ... |
| 150,000 | 10 | Apl. 4 | 6 | 6 | San Paulo 6 p.c. Pref. ... | 7—7½ | ... | 7½ |
| 1,786,968 | Stk. | Sept. 5 | 6 | 6 | Sheffield Cons. ... ... | 108—112[e*] | ... | ... |
| 95,000 | ,, | July 18 | 4 | 4 | Do. 4 p.c. Deb. ... ... | 92—96[e] | ... | ... |
| 133,201 | ,, | Sept. 5 | 5 | 8½ | Shrewsbury 5 p.c. Ord. ... | 108—113* | ... | ... |
| 90,000 | 10 | June 6 | 15 | 15 | South African ... ... | 4—6 | ... | ... |
| 6,709,895 | Stk. | Aug. 8 | 7 | 5 | South Met. Ord. ... ... | 112—117 | ... | 113—114½ |
| 1,135,812 | ,, | ,, | 6 | 6 | Do. 6 p.c. Irred. Pf. | 130—135 | ... | 131—132½ |
| 1,895,445 | ,, | July 4 | 3 | 3 | Do. 3 p.c. Deb. ... | 75—80 | ... | ... |
| 1,000,000 | ,, | July 18 | 4 | 5 | Do. 5 p.c. Red. Deb. | 108—113 | ... | 110—112 |
| 91,500 | ,, | Aug. 8 | 8½ | 8½ | South Shields Con. ... ... | 130—131[d] | ... | ... |
| 1,543,795 | ,, | Aug. 8 | 6 | 6 | South Suburban Ord. 5 p.c. | 110—115 | ... | 111½ |
| 300,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. | 108—113 | ... | ... |
| 668,887 | ,, | June 20 | 5 | 5 | Do. 5 p.c. Deb. | 116—121 | ... | ... |
| 647,740 | ,, | Aug. 22 | 5 | 5 | Southampt'n Ord. 5 p.c. max. | 93—98 | ... | ... |
| 121,275 | ,, | June 20 | 4 | 4 | Do. 4 p.c. Deb. | 88—93 | ... | ... |
| 200,000 | ,, | June 20 | 6½ | 6½ | Swansea 6½ p.c. Red. Deb. | 105—110 | ... | ... |
| 1,076,490 | ,, | Aug. 8 | 6⅔ | 6⅔ | Tottenham and District Ord. | 127—132 | ... | ... |
| 300,000 | ,, | ,, | 5½ | 5½ | Do. 5½ p.c. Pref. ... | 112—117 | −2 | 115 |
| 199,005 | ,, | June 20 | 4 | 4 | Do. 4 p.c. Deb. ... | 91—96 | ... | ... |
| 85,701 | ,, | Apl. 4 | 6 | 6 | Tuscan, Ltd., 6 p.c. Red. Db. | 70—75 | ... | ... |
| 345,069 | ,, | Aug. 22 | 7 | 7 | Uxbridge, Maidenhead, & Wycombe 5 p.c. ... ... | 128—133 | ... | ... |
| 88,380 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... | 100—105 | ... | ... |
| 1,522,220 | ,, | July 4 | 7 | 7 | Wandsworth Consolidated | 130—140 | ... | ... |
| 971,373 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref. ... ... | 108—113 | ... | 108½—109 |
| 1,167,964 | ,, | June 20 | 5 | 5 | Do. 5 p.c. Deb. ... ... | 115—120 | ... | 115—118 |
| 158,400 | ,, | Aug. 22 | 5g | 5 | Winchester W.,& G.5p.c.Con. | 98—103 | ... | ... |

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g* Paid £3, including 10s. on account of back dividends. * Ex. div. † Paid free of income-tax. ‡ For year.

*(This announcement is inserted gratuitously.)*

# PETER—WITH ONE EXCEPTION

With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun and on occasions—be it admitted—of naughtiness.

Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception.

Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated, and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea!

THE CHAIRMAN,

**SCHOOL FOR THE BLIND**

(Founded 1838),

**Swiss Cottage, LONDON, N.W.3**

# STEEL BENDS.

**The illustration shows some 24 in. steel off-set pipes with flanges welded on, recently supplied by the company; attention is directed to the smooth curve and the consequent favourable effect upon flow.**

STEWARTS AND LLOYDS LTD
GLASGOW + BIRMINGHAM + LONDON